Supplementary Figures 1, Area descriptions

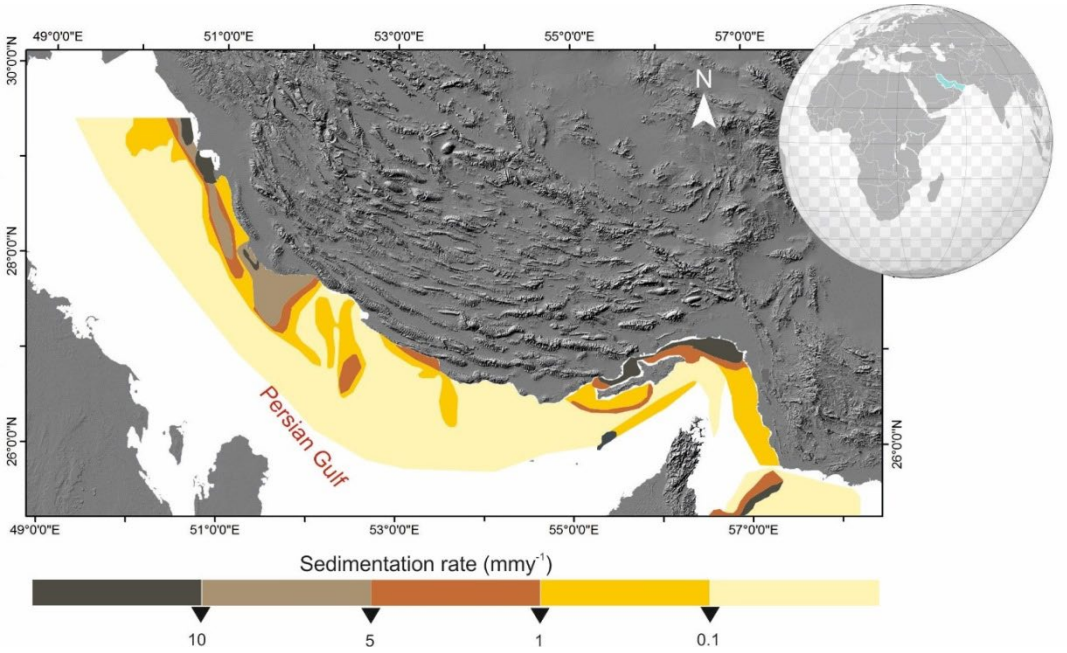


Fig. S 1.1. Sedimentation rate in the Persian Gulf (Lahijani et al., 2020; Naderi et al., 2024).

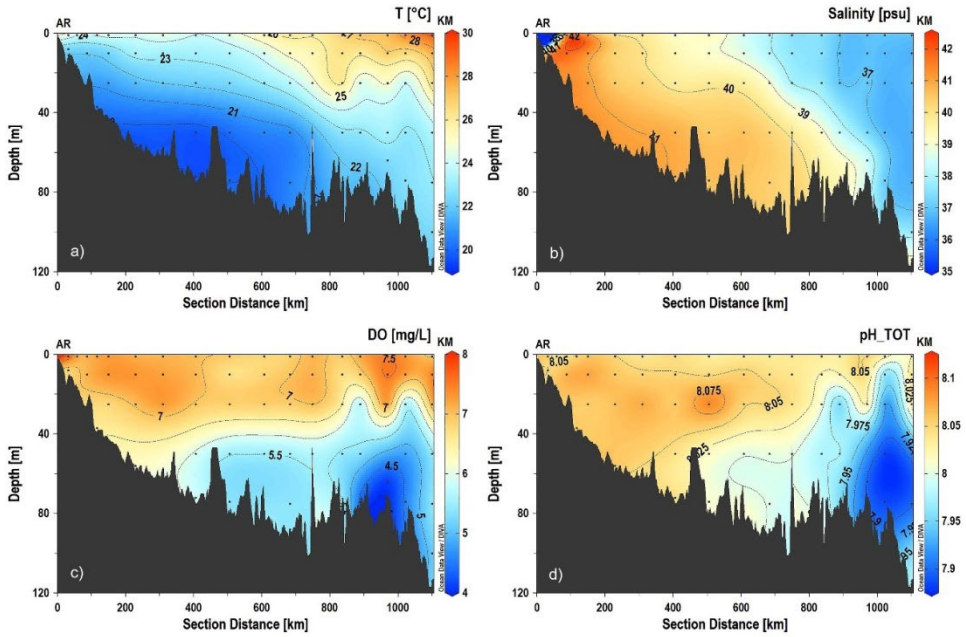


Fig. S 1.2. Water column properties in a longitudinal section in the Persian Gulf, a) temperature, b) salinity, c) dissolved oxygen and d) pH

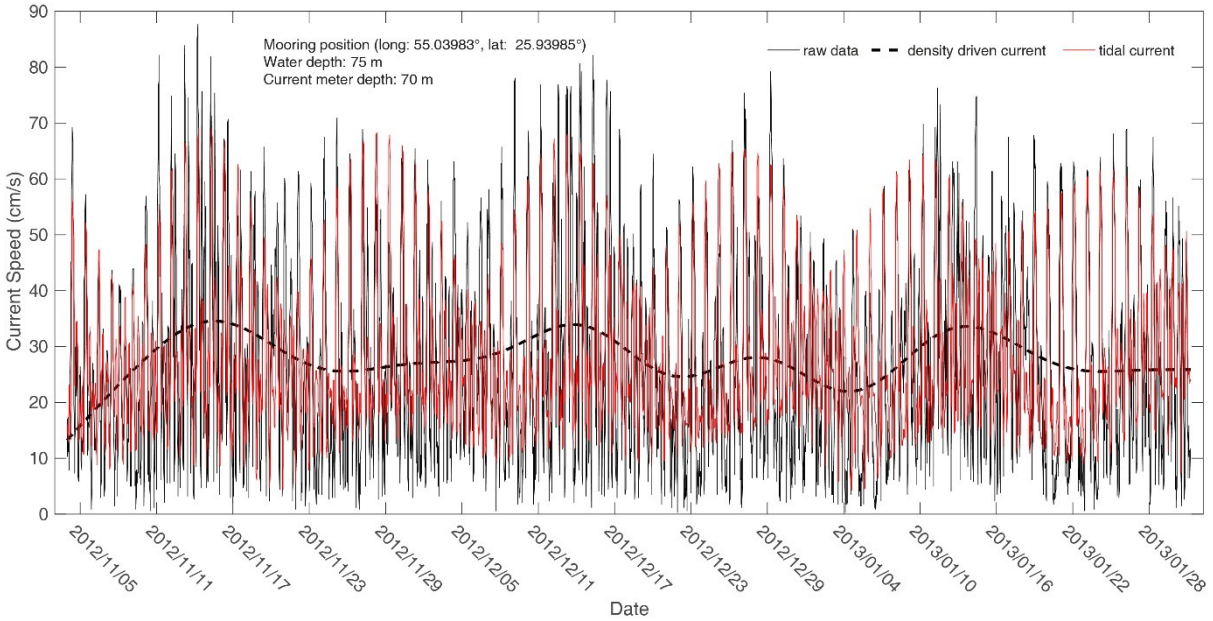


Fig. S 1.3. Current speed near Abu-Musa Island in the Persian Gulf

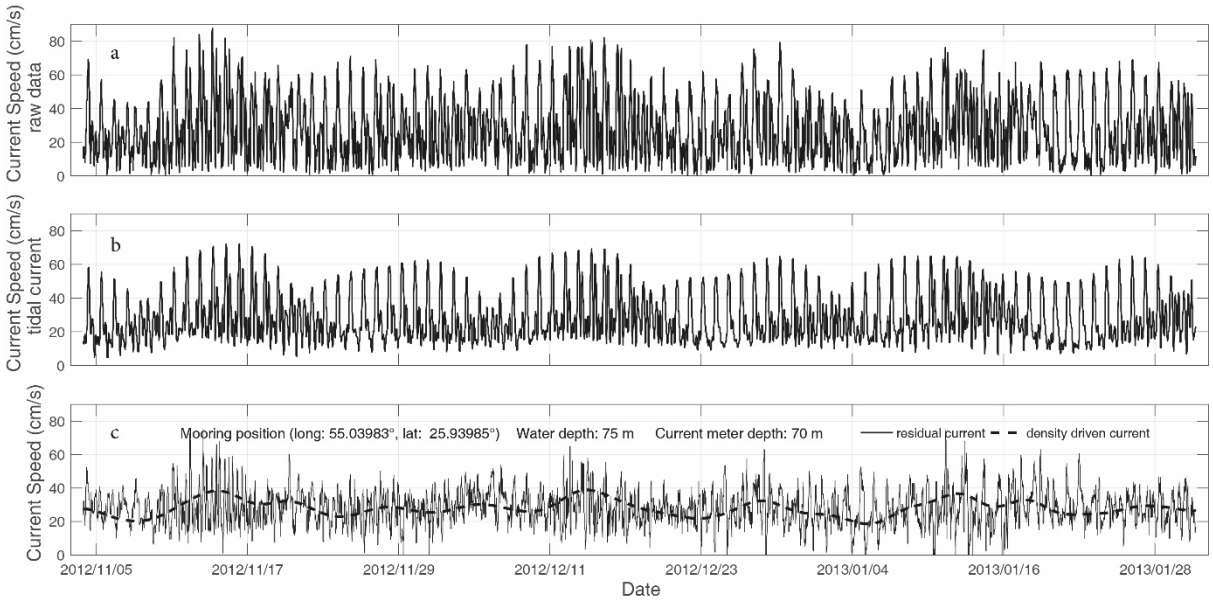


Fig. S 1.4. Current Speed of a) raw data, b) tidal current and c) residual current (line) and density current (dash-line near bottom of North part of Abu-Musa Island.

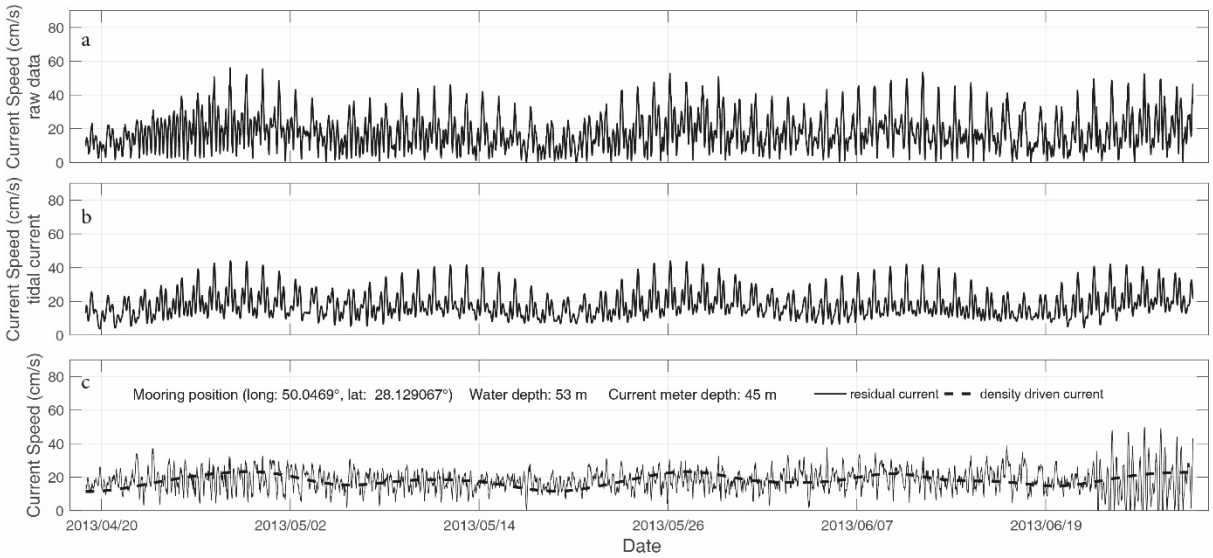


Fig. S 1.5. Current Speed of a) raw data, b) tidal current and c) residual current (line) and density current (dash-line near bottom of North-west part of Persian Gulf.

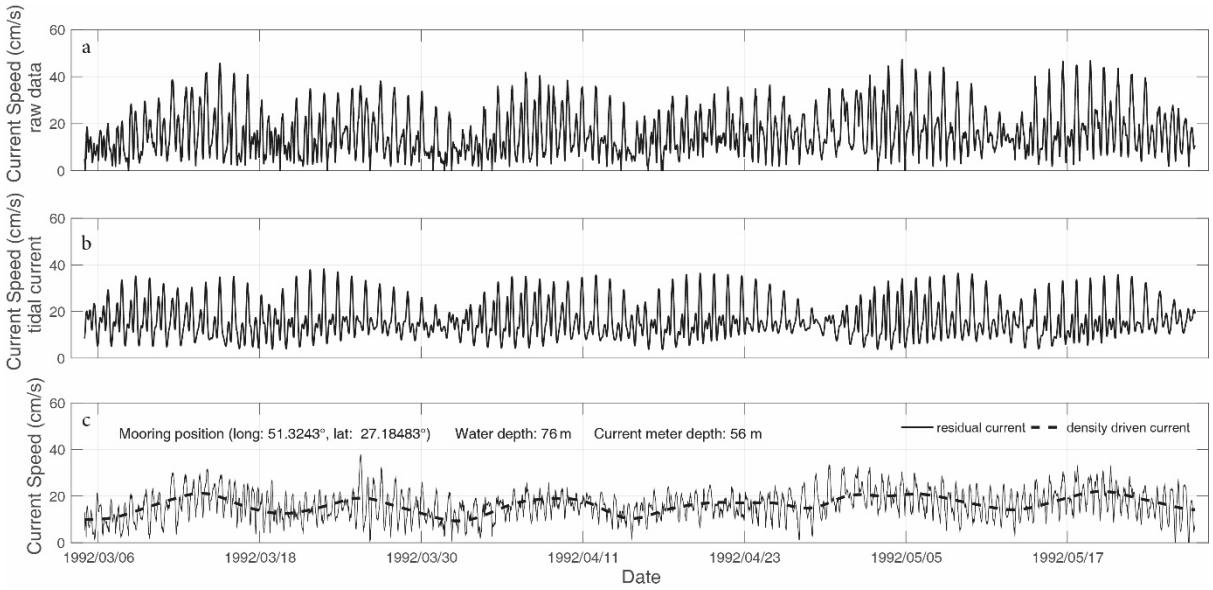


Fig. S 1.6. Current Speed of a) raw data, b) tidal current and c) residual current (line) and density current (dash-line near bottom of the Hormuz Strait.

Supplementary Figures 2, Surface Sediments

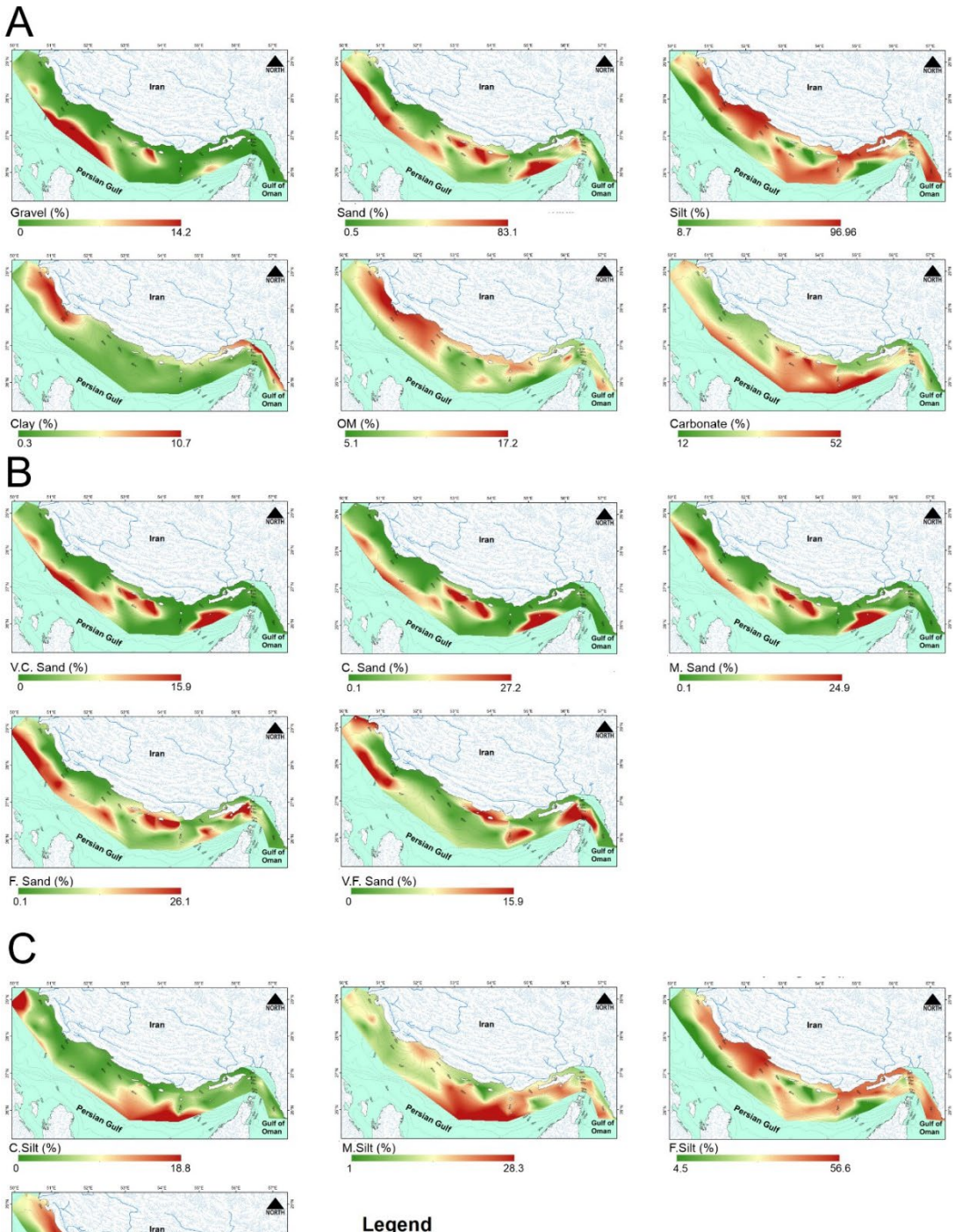

A
Iran
Persian Gulf
Gulf of Oman
NORTH
Gravel (%)
0
14.2
Sand (%)
0.5
83.1
Silt (%)
8.7
96.96
Clay (%)
0.3
10.7
OM (%)
5.1
17.2
Carbonate (%)
12
52
B
V.C. Sand (%)
0
15.9
C. Sand (%)
0.1
27.2
M. Sand (%)
0.1
24.9
F. Sand (%)
0.1
26.1
V.F. Sand (%)
0
15.9
C
C.Silt (%)
0
18.8
M.Silt (%)
1
28.3
F.Silt (%)
4.5
56.6
Legend

Fig. S 2.1. Sediment grain size, organic matter (OM) and carbonate distribution patterns in the Persian Gulf. B) Distribution patterns of different sand sizes and C) silt sizes in the Persian Gulf.

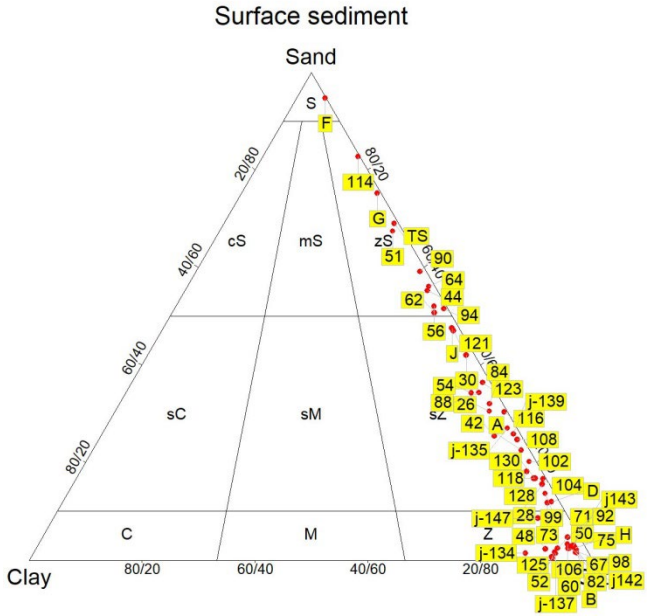


Fig. S 2.2. Surface sediment classification of the Persian Gulf based on Folk (1974) ternary diagram.

Supplementary Figures 3, XRD Mineralogy

XRD result for coastal sediment

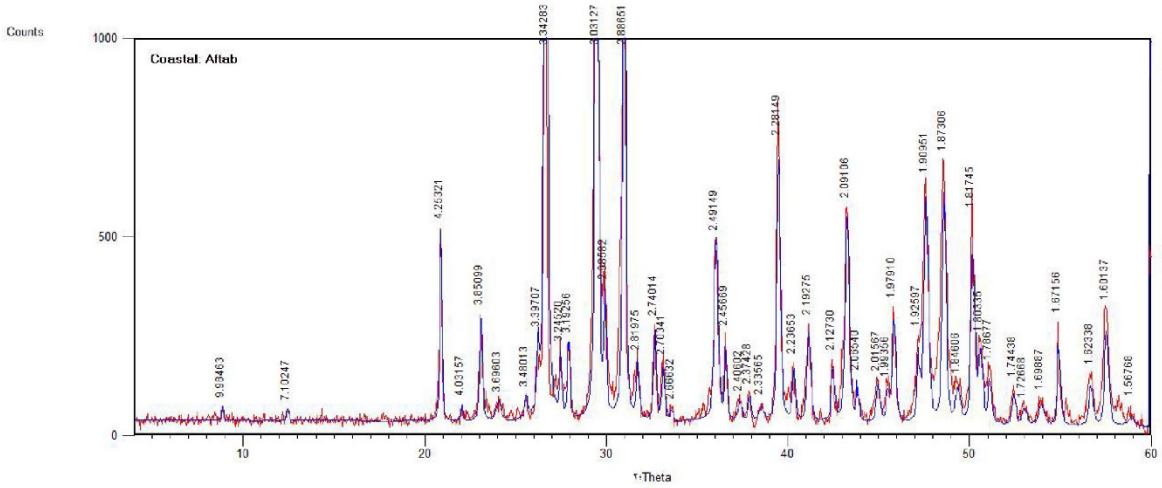


Fig. S 3.1. XRD peak for Aftab coastal sediment

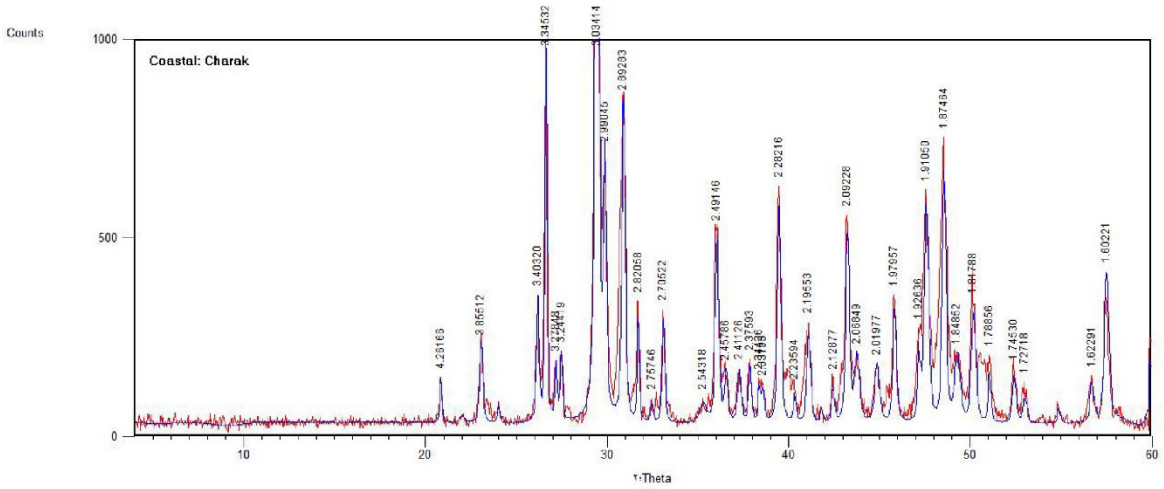


Fig. S 3.3. XRD peak for Charak coastal sediment

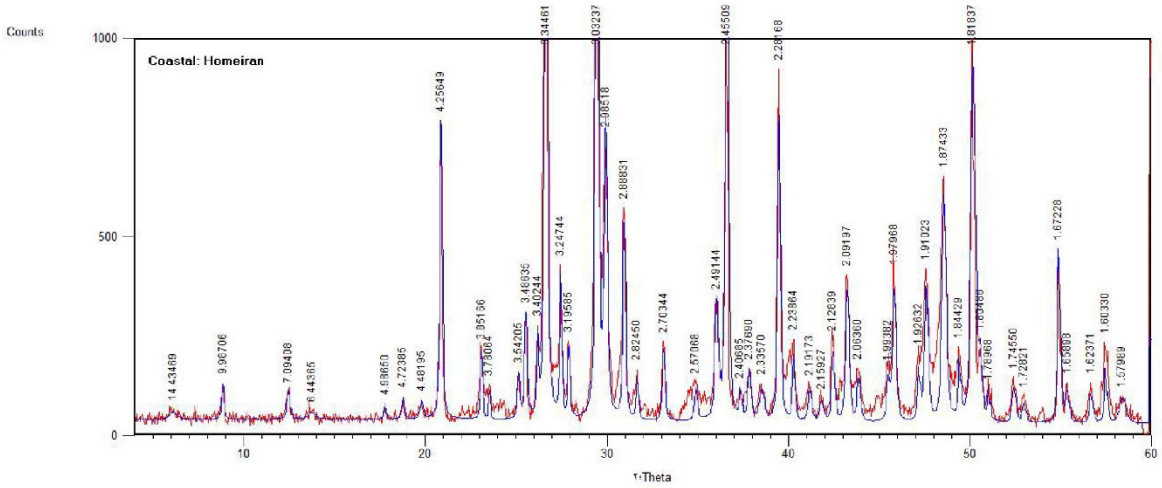


Fig. S 3.4. XRD peak for Homeiran coastal sediment

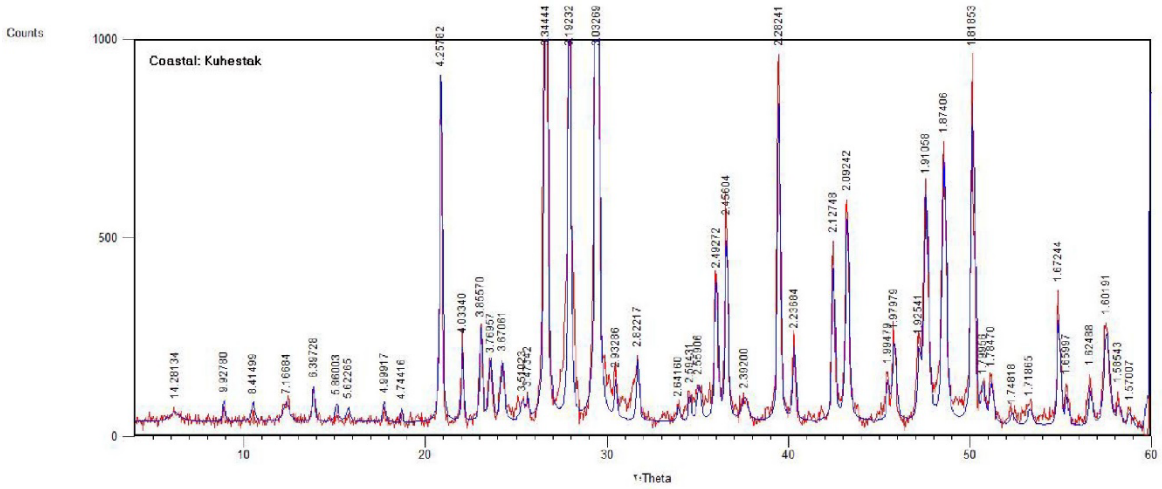


Fig. S 3.5. XRD peak for Kuhestak coastal sediment

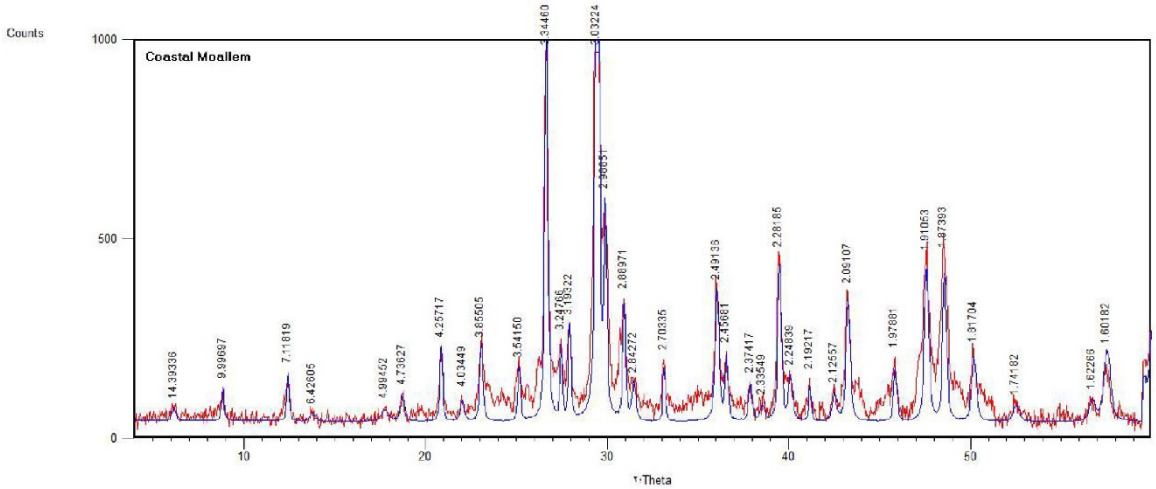


Fig. S 3.6. XRD peak for Moallem coastal sediment

XRD result for Core T5S3

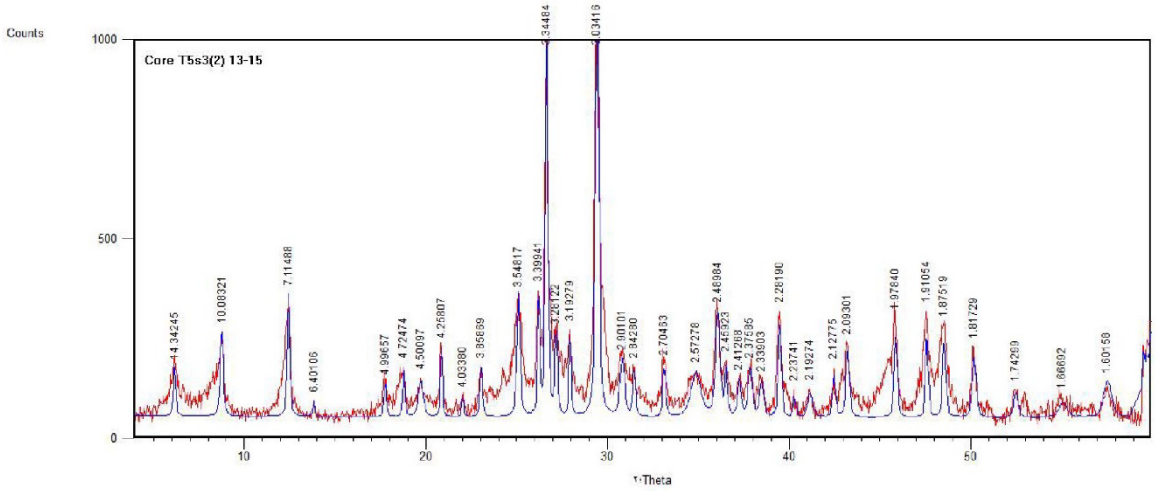


Fig. S 3.7. XRD peak for depth 13-15

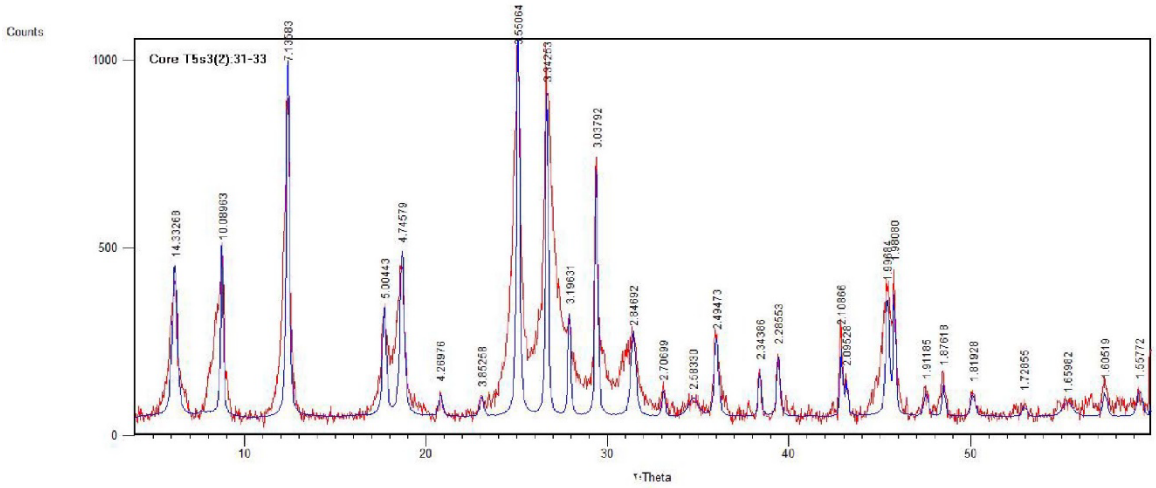


Fig. S 3.8. XRD peak for depth 31-33

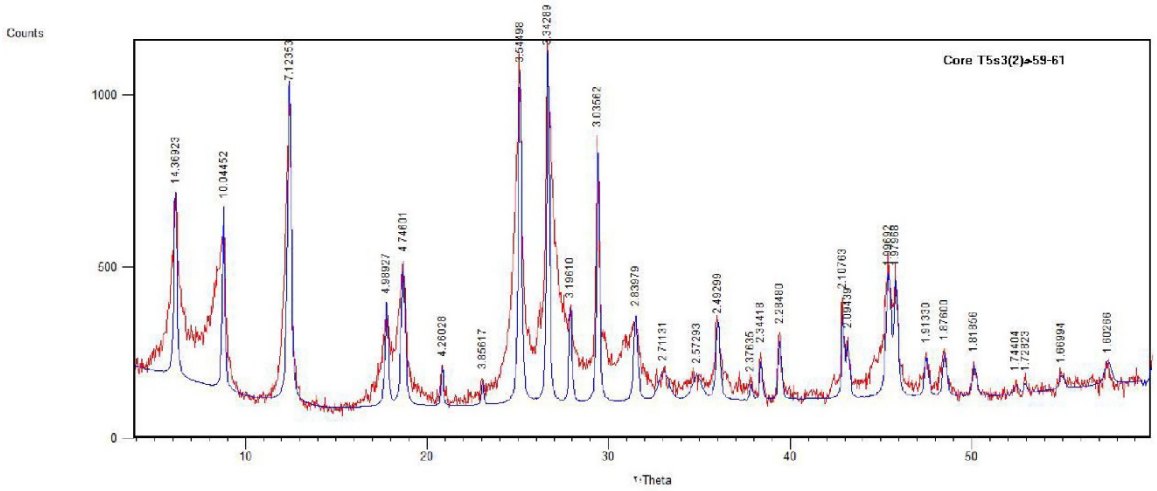


Fig. S 3.9. XRD peak for depth 59-61

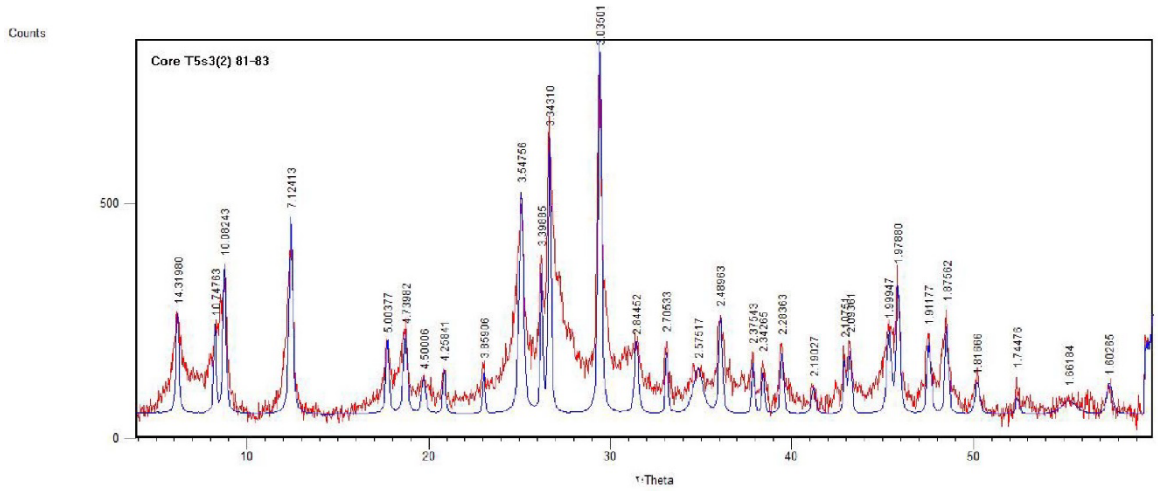


Fig. S 3.10. XRD peak for depth 81-83

XRD result for Core T5S4

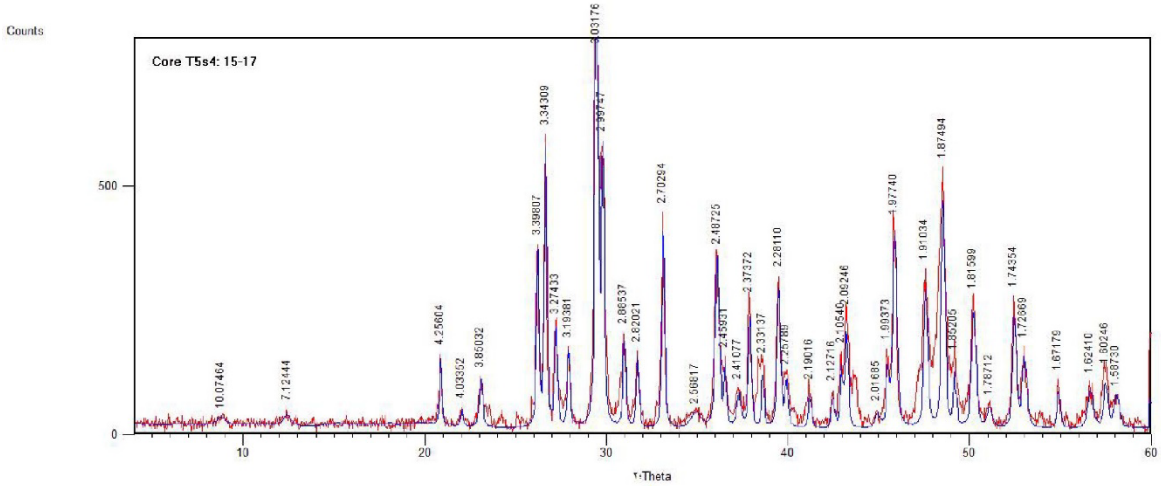


Fig. S 3.11. XRD peak for depth 15-17

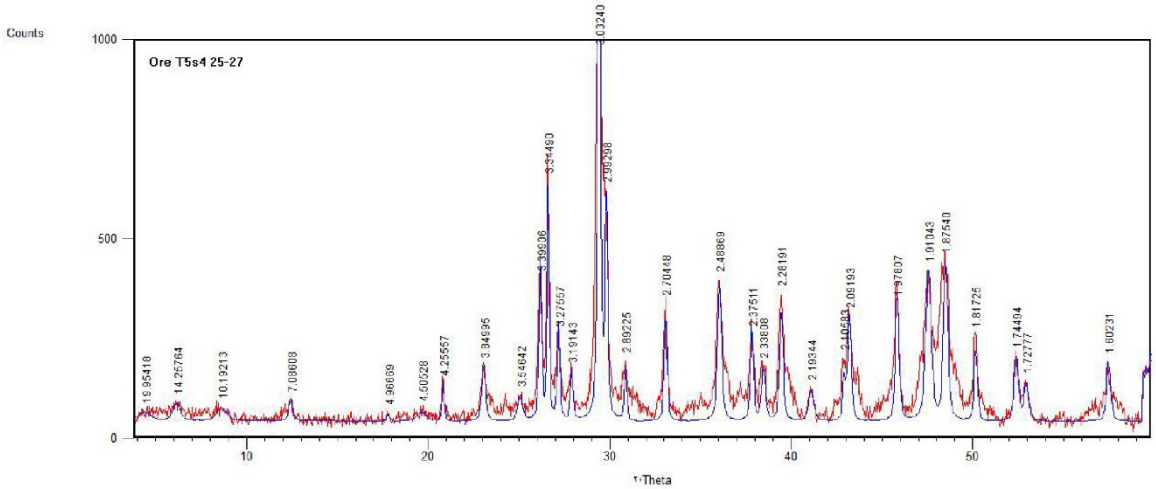


Fig. S 3.12. XRD peak for depth 25-27

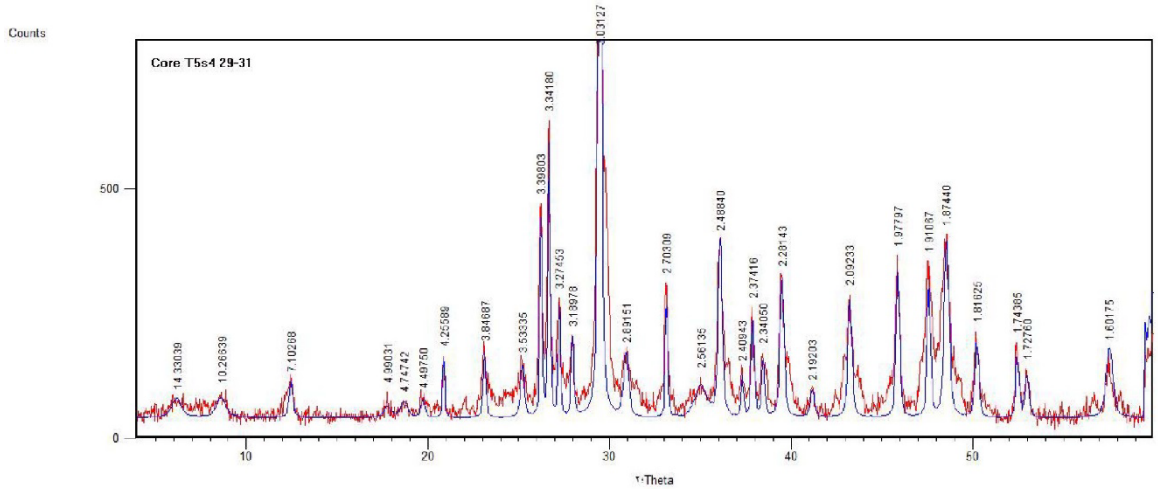


Fig. S 3.13. XRD peak for depth 29-31

XRD result for marine surface sediment samples

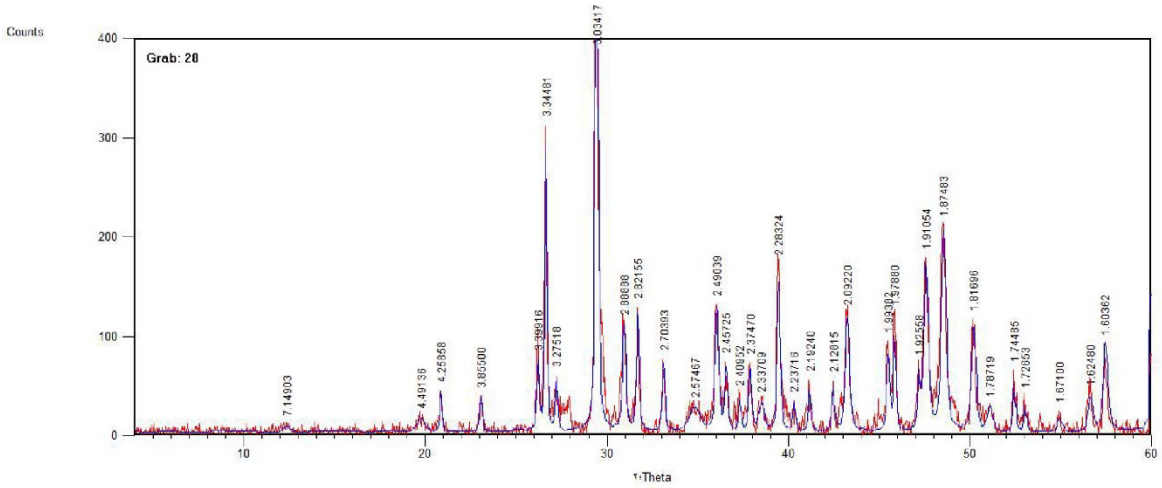


Fig. S 3.14. XRD peak for sample 28

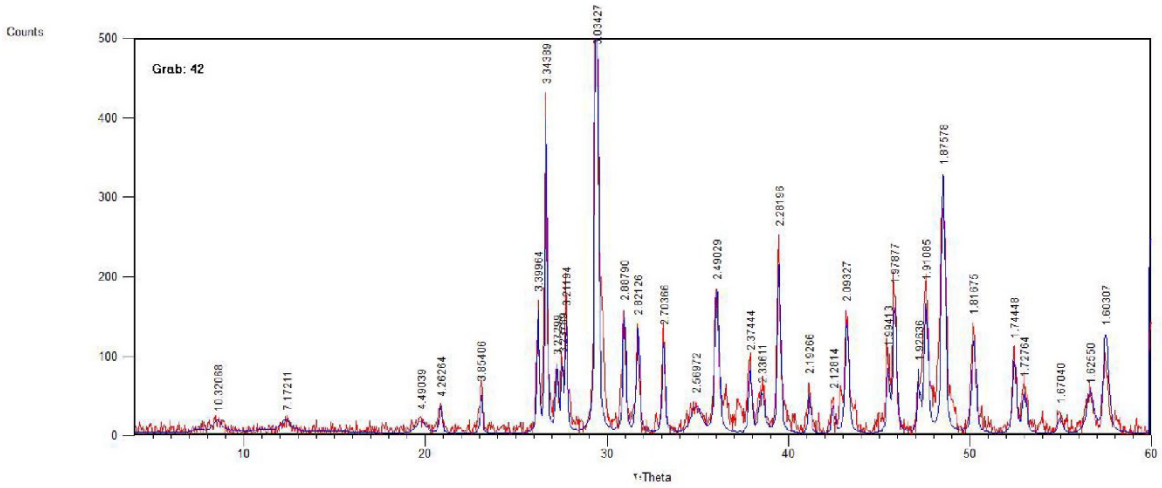


Fig. S 3.14. XRD peak for sample 42

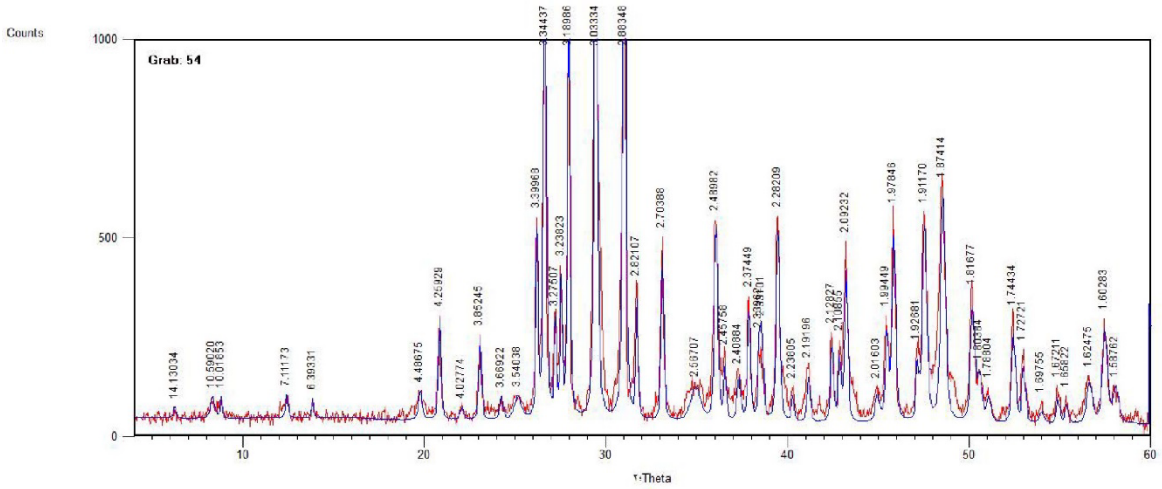


Fig. S 3.15. XRD peak for sample 54

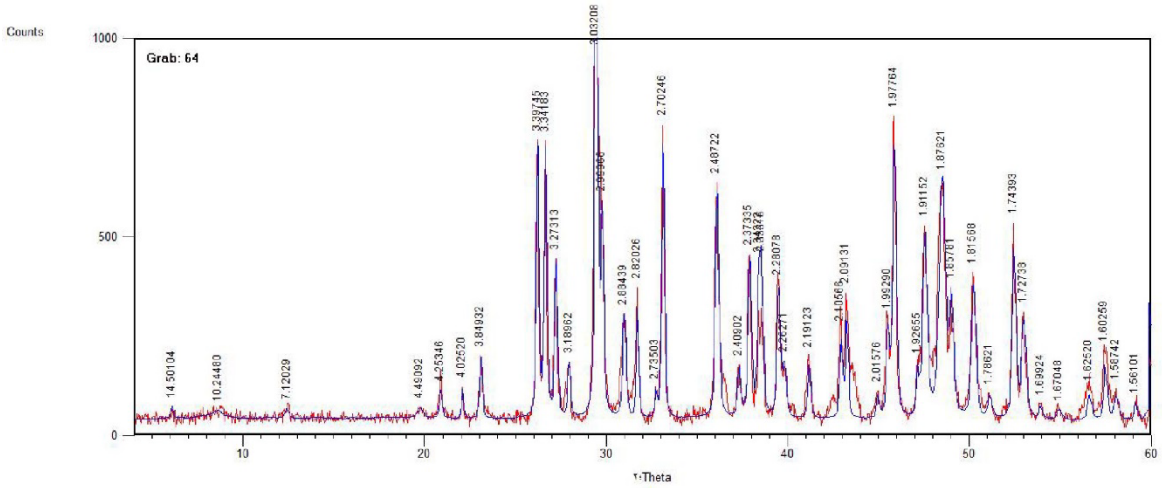


Fig. S 3.16. XRD peak for sample 64

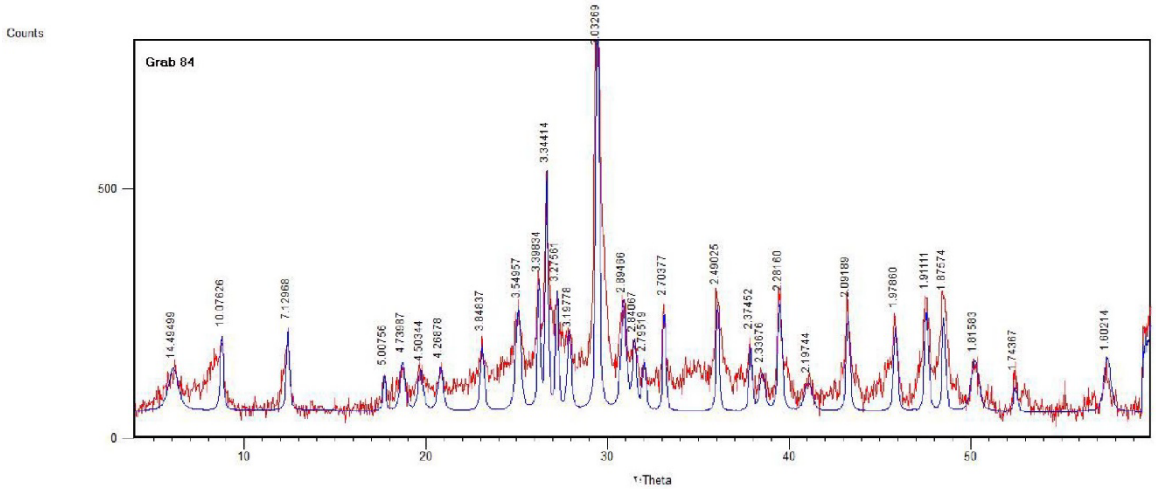


Fig. S 3.17. XRD peak for sample 84

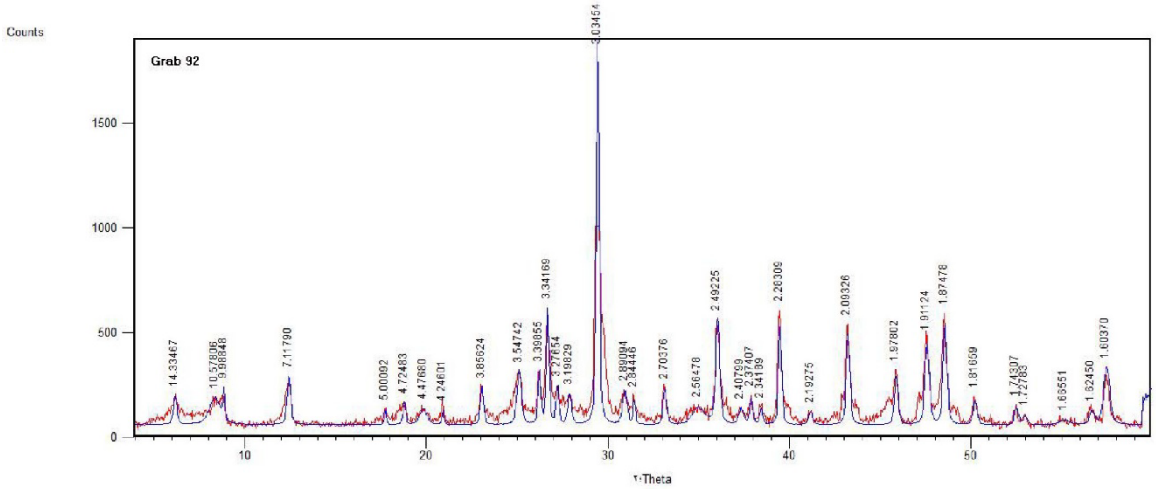


Fig. S 3.18. XRD peak for sample 92

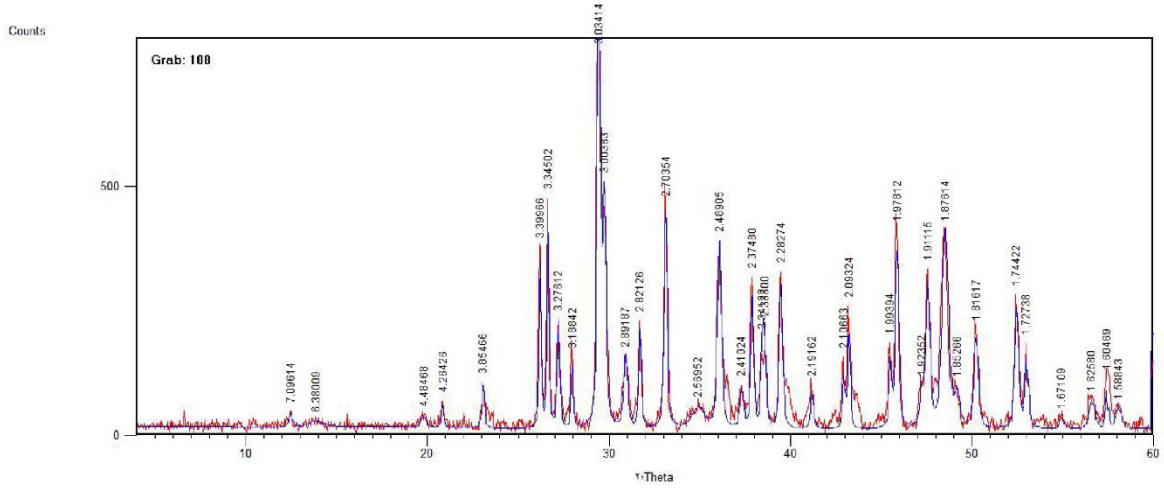


Fig. S 3.19. XRD peak for sample 108

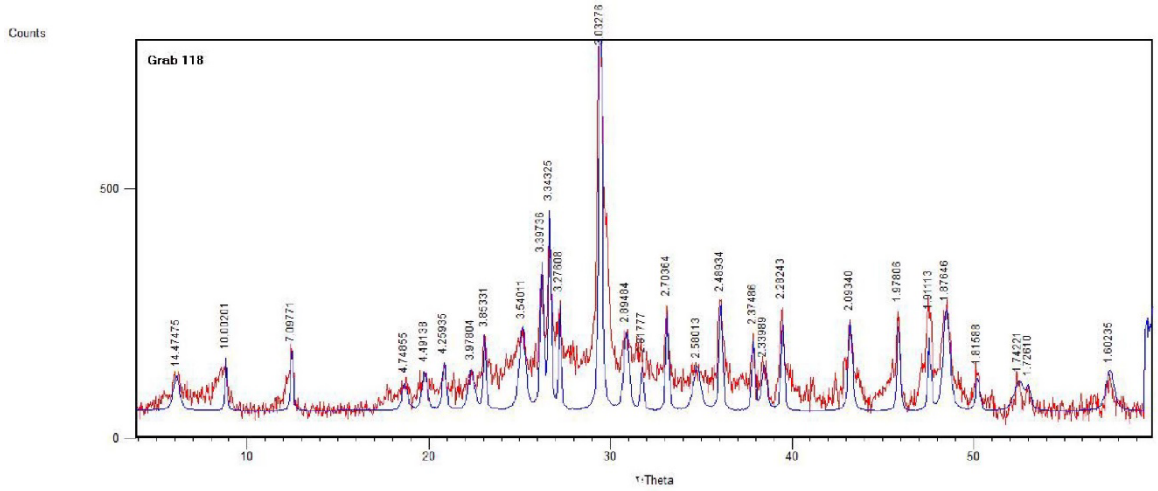


Fig. S 3.20. XRD peak for sample 118

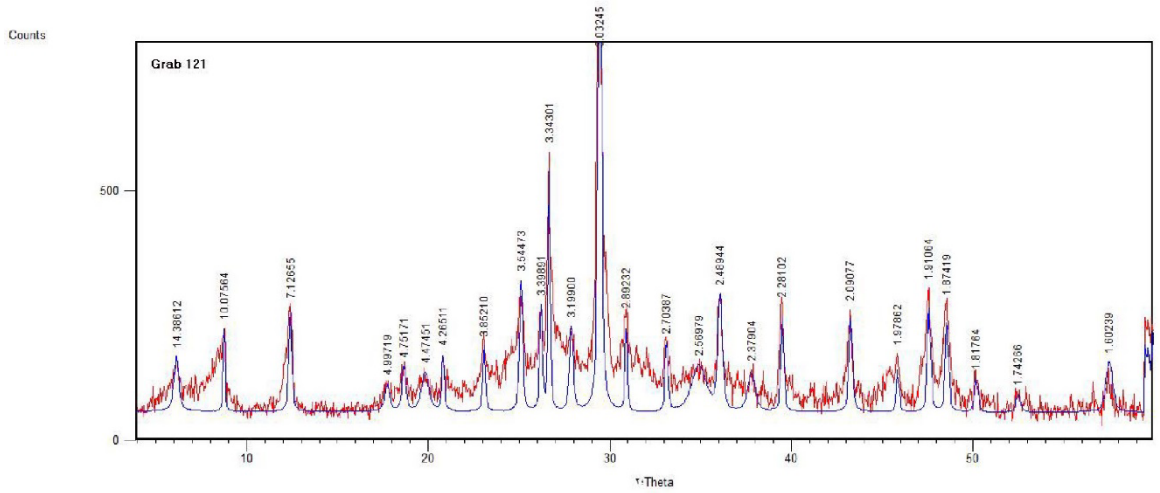


Fig. S 3.21. XRD peak for sample 121

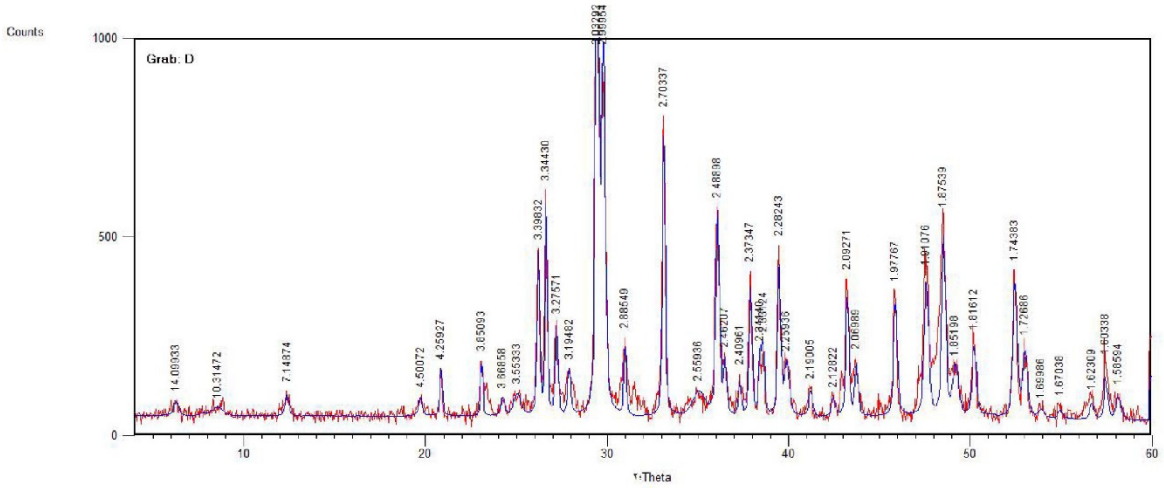


Fig. S 3.22. XRD peak for sample D

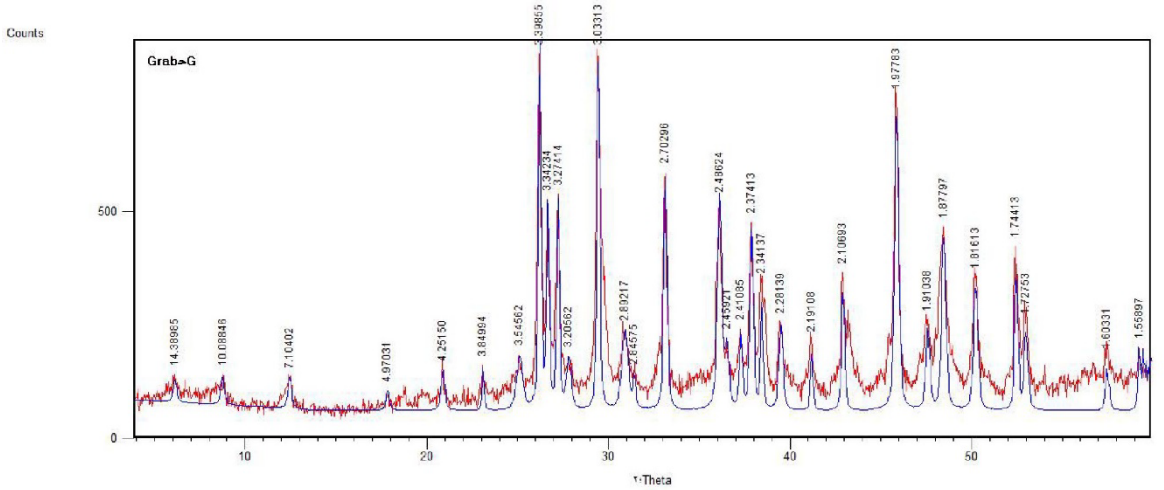


Fig. S 3.23. XRD peak for sample G

Supplementary Figures 4, Thin Sections of Coastal sediment

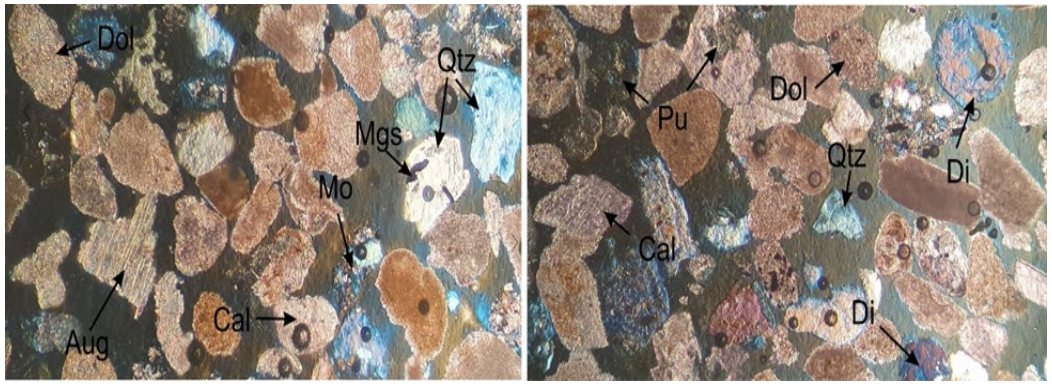


Fig. S 4.1. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Aftab station. Cal: Calcite, Dol: Dolomite, Di: Diopsid, Mo: Monetite, Mgs: Magnesite, Qtz: Quartz, Aug: Augite, Pu: Pumpellyite

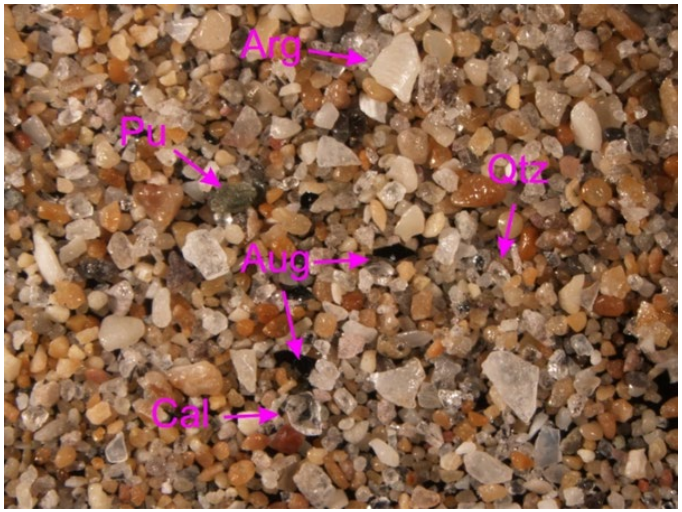


Fig. S 4.2. Binocular microscopy image for Aftab costal sediment with magnifier 11.5X. Cal: Calcite, Qtz: Quartz, Arg: Aragonite, Aug: Augite, Pu: Pumpellyite

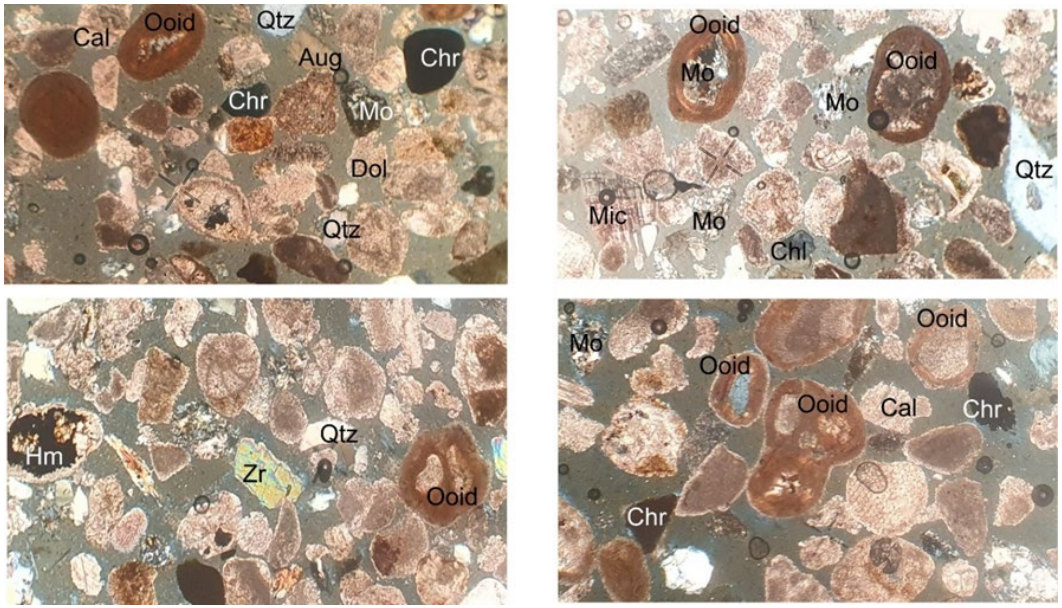


Fig. S 4.3. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Dopalangan station. Cal: Calcite, Dol: Dolomite, Di: Diopsid, Mo: Monetite, Mgs: Magnesite, Qtz: Quartz, Arg: Aragonite, Aug: Augite, Ank: Ankerit, Pu: Pumpellyite, Chr: Chromite, Zr: Zircon, Hm: Hematite

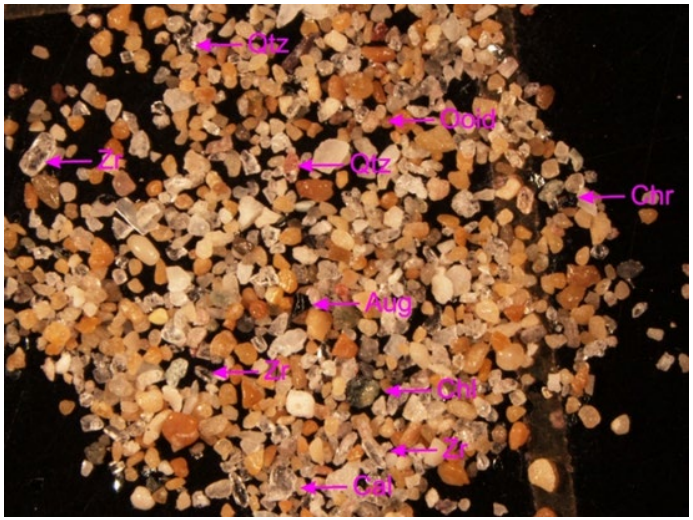


Fig. S 4.4. Binocular microscopy image for Aftab costal sediment with magnifier 11.5X. Cal: Calcite, Chl: Chlorite, Qtz: Quartz, Arg: Aragonite, Aug: Augite, Chr: Chromite, Zr: Zircon.

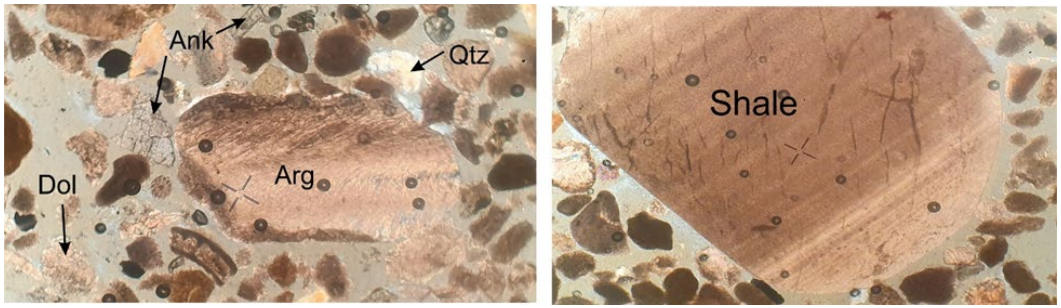


Fig. S 4.5. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Charak station. Dol: Dolomite, Qtz: Quartz, Arg: Aragonite, Ank: Ankerit.

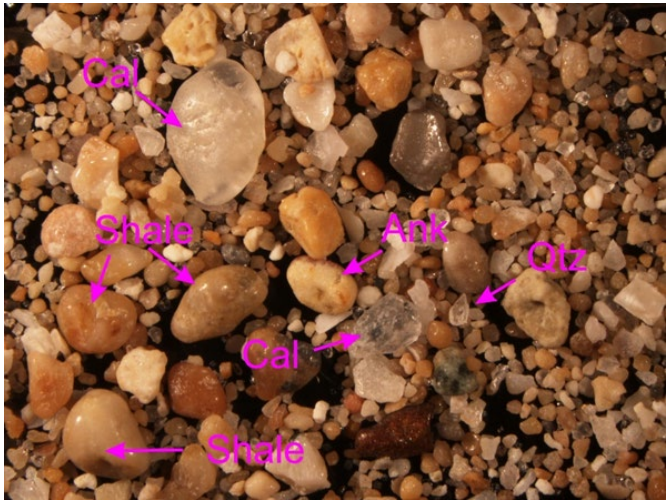


Fig. S 4.6. Binocular microscopy image for Charak costal sediment with magnifier 11.5X. Cal: Calcite, Qtz: Quartz, Ank: Ankerit.

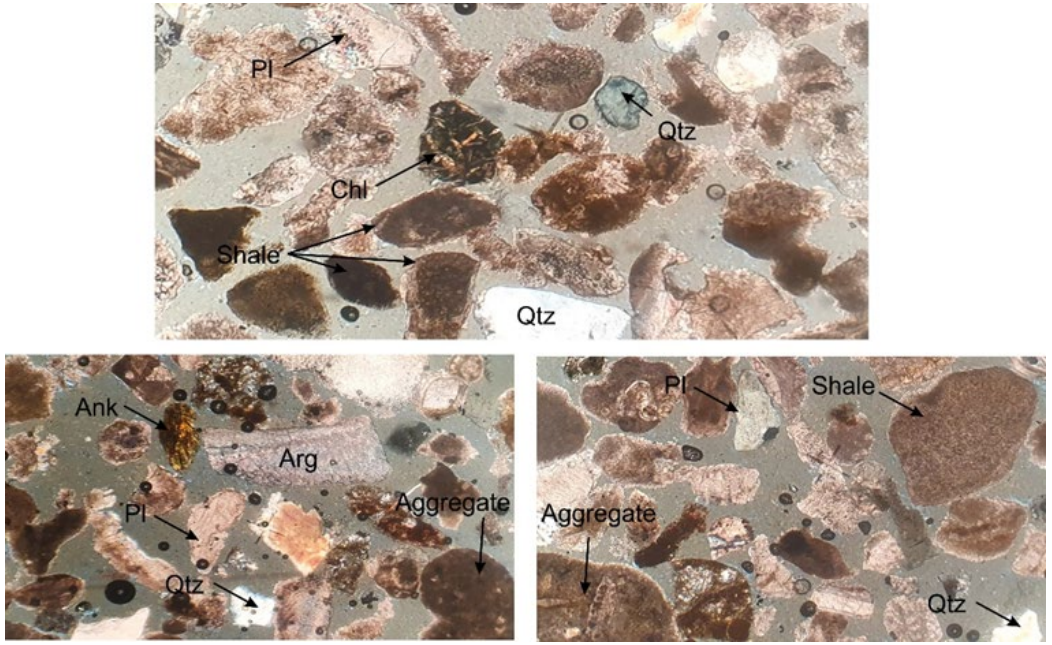


Fig. S 4.7. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Bostano station. Qtz: Quartz, Arg: Aragonite, Ank: Ankerit, Chl: Chlorite, Pl: Plagioclase.

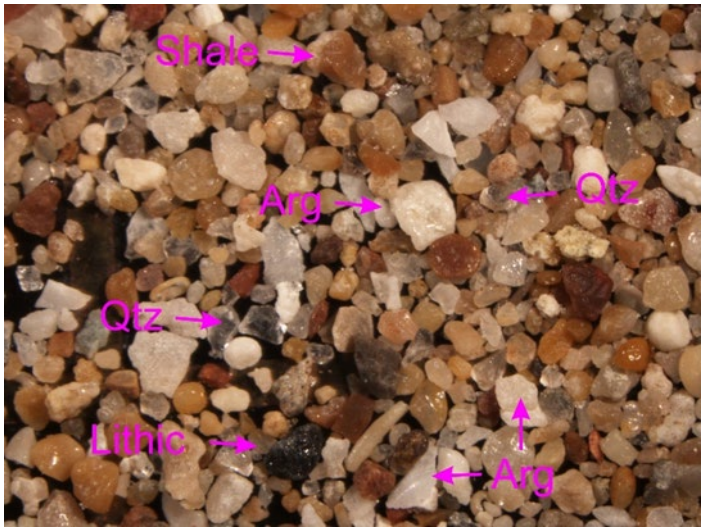


Fig. S 4.8. Binocular microscopy image for Bostano costal sediment with magnifier 11.5X. Qtz: Quartz, Arg: Aragonite, Ank: Ankerit, Chl: Chlorite, Pl: Plagioclase.

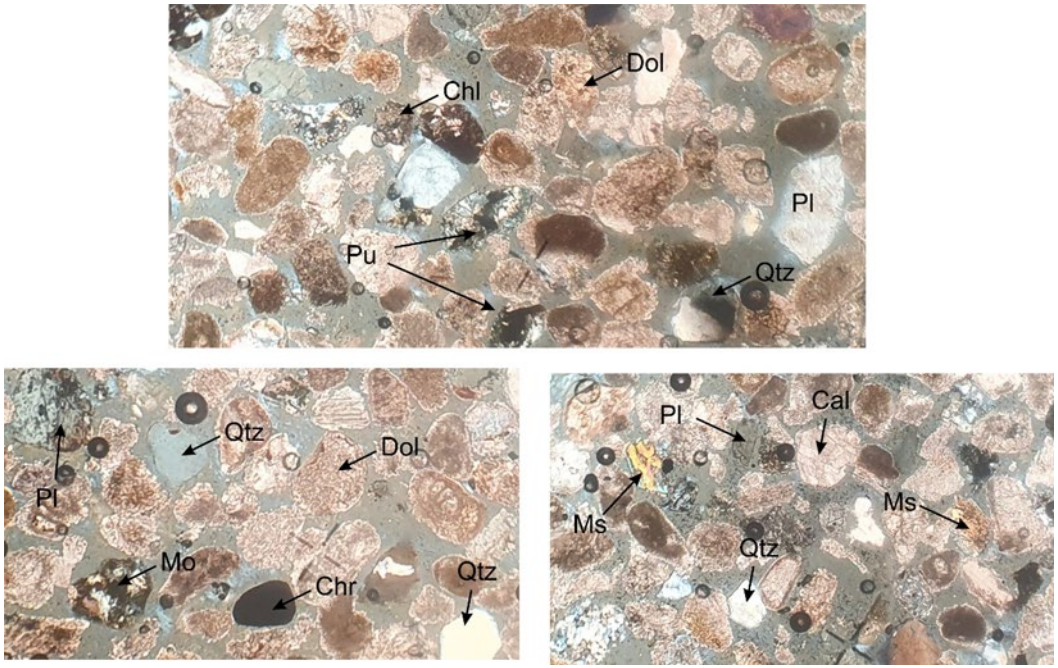


Fig. S 4.9. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Mogham station. Cal: Calcite, Dol: Dolomite, Mo: Monetite, Ms: Muscovite, Qtz: Quartz, Pu: Pumpellyite, Chl: Chlorite, Chr: Chromite.

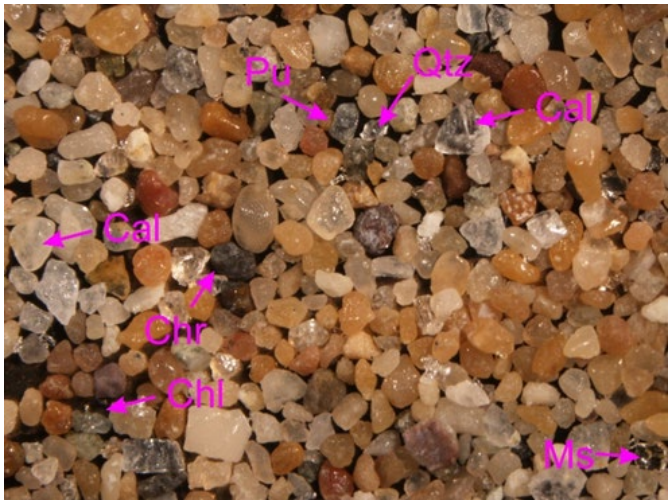


Fig. S 4.10. Binocular microscopy image for Mogham costal sediment with magnifier 11.5X. Cal: Calcite, Ms: Muscovite, Qtz: Quartz, Pu: Pumpellyite, Chl: Chlorite, Chr: Chromite..

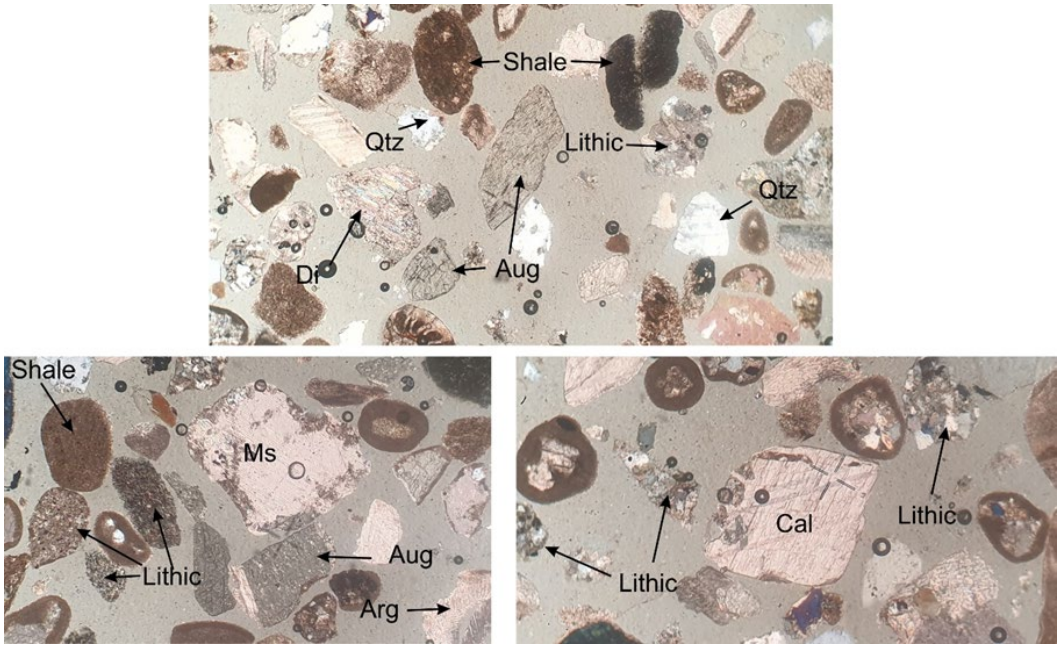


Fig. S 4.11. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Homeiran station. Cal: Calcite, Di: Diopsid Qtz: Quartz, Aug: Augite, Ms: Muscovite. Arg: Aragonite,

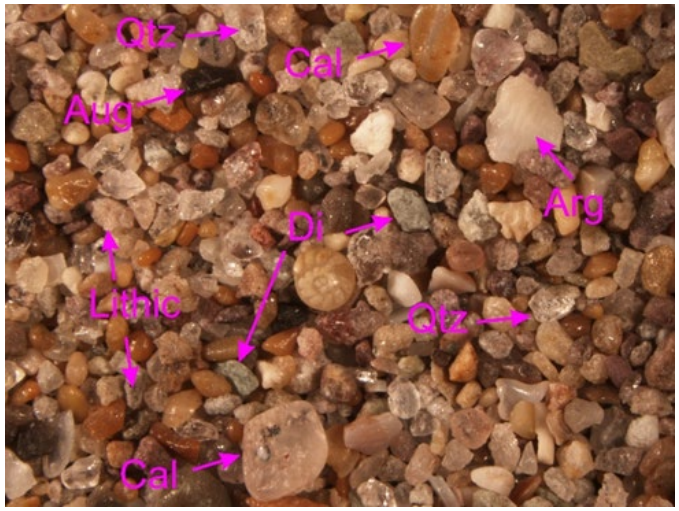


Fig. S 4.12. Binocular microscopy image for Homeiran costal sediment with magnifier 11.5X. Cal: Calcite, Di: Diopsid Qtz: Quartz, Aug: Augite, Ms: Muscovite. Arg: Aragonite.

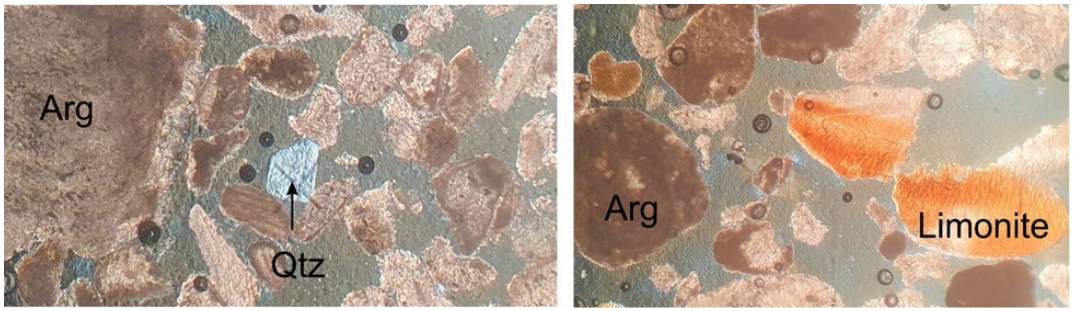


Fig. S 4.13. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Kish station. Qtz: Quartz, Li: Limonite, Arg: Aragonite.

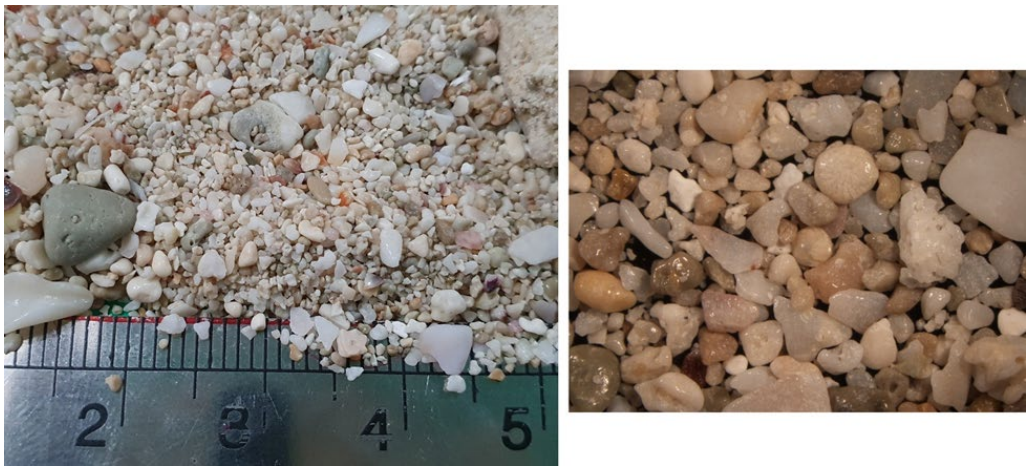


Fig. S 4.14 Binocular microscopy image for Kish costal sediment with magnifier 10.5X.

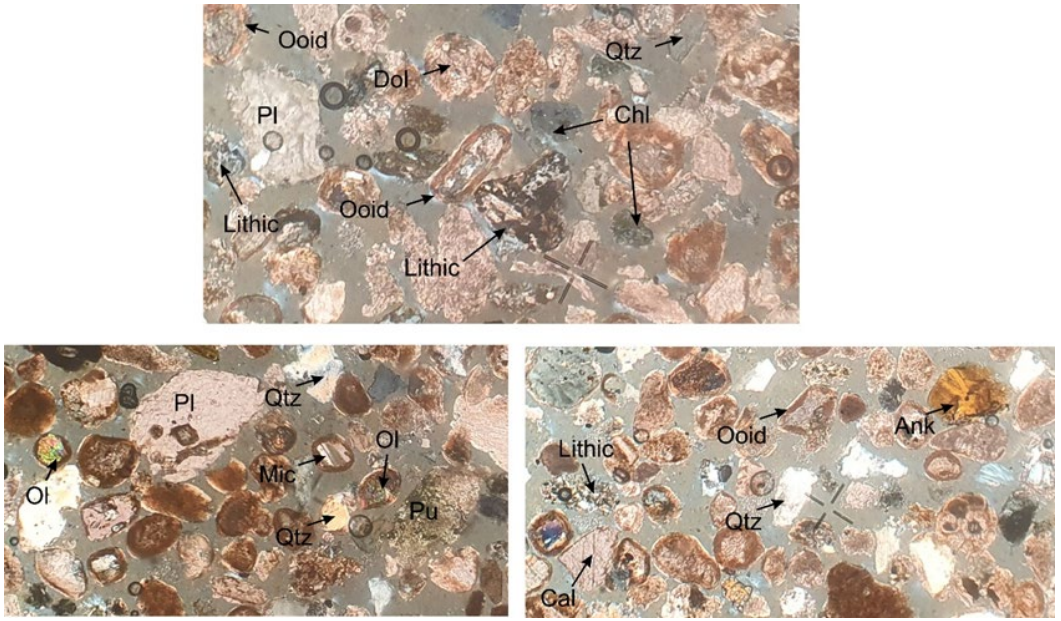


Fig. S 4.15. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Kohestak station. Cal: Calcite, Dol: Dolomite, Qtz: Quartz, Pu: Pumpellyite, Pl: Plagioclase, Mi: Microcline, Ol: Olivin, Ank: Ankerit, Chl: Chlorite,

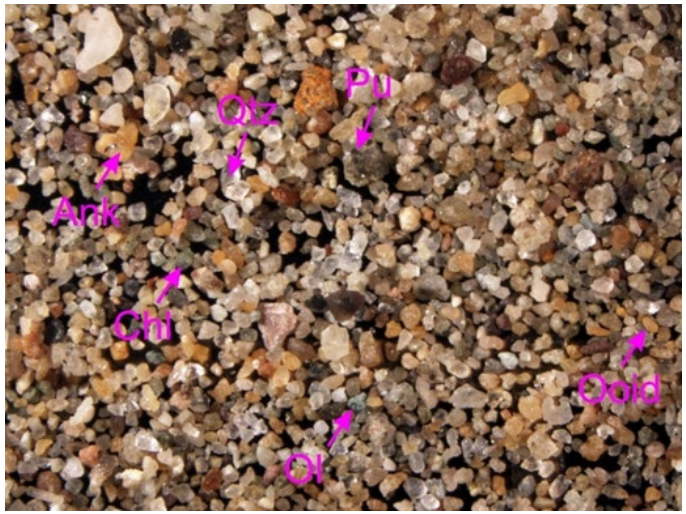


Fig. S 4.16. Binocular microscopy image for Kohestak costal sediment with magnifier 12X. Qtz: Quartz, Pu: Pumpellyite, Ol: Olivin, Ank: Ankerit, Chl: Chlorite, Aug: Augite.

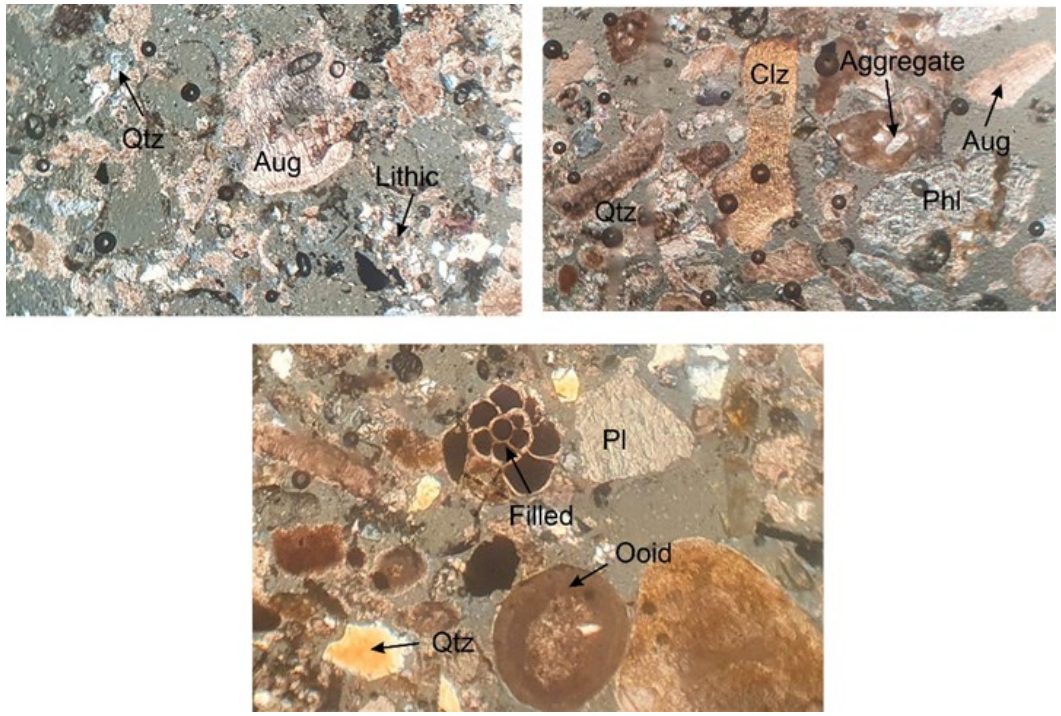


Fig. S 4.17. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Moalem station. Qtz: Quartz, Pl: Plagioclase, Clz: Clinozoisite, Phl: Polyhalite, .

Fig. S 4.18. Binocular microscopy image for Moalem costal sediment with magnifier 11.5X.

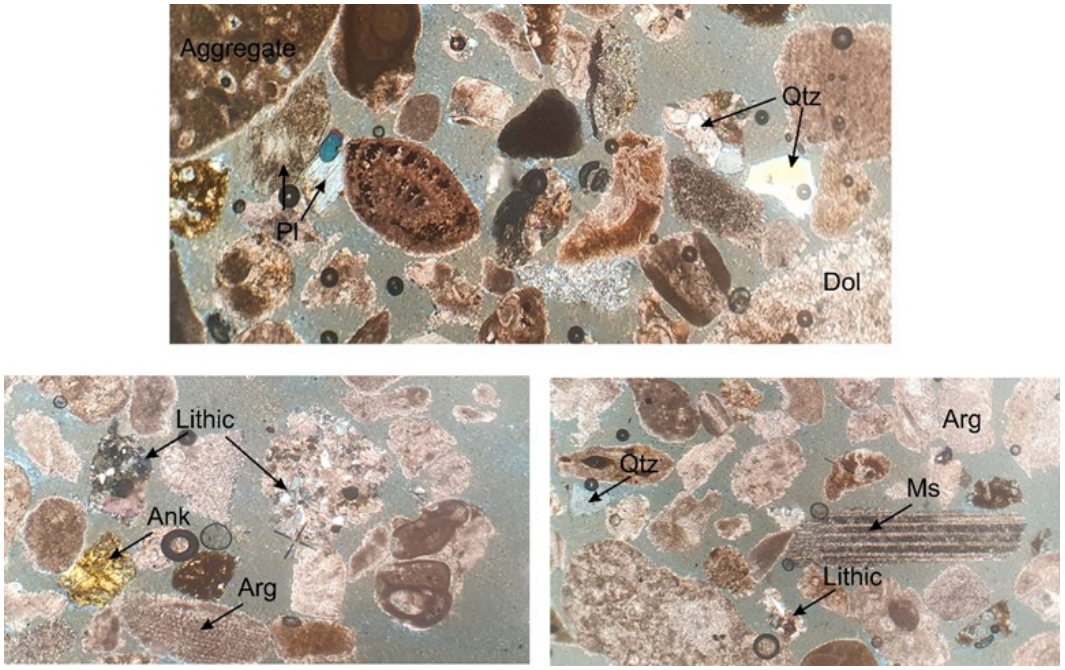


Fig. S 4.19. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Mogham station. Dol: Dolomite, Qtz: Quartz, Arg: Aragonite, Ank: Ankerit, Ms: Muscovite, Pl: Plagioclase.

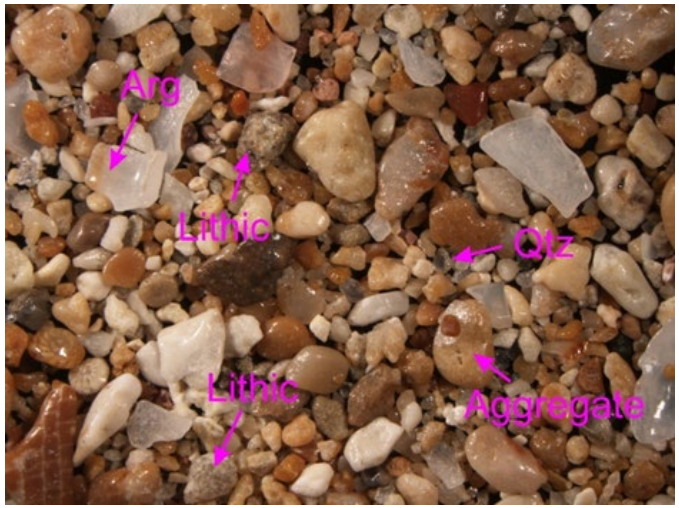


Fig. S 4.20. Binocular microscopy image for Mogham costal sediment with magnifier 11.5X. Arg: Aragonite, Qtz: Quartz.

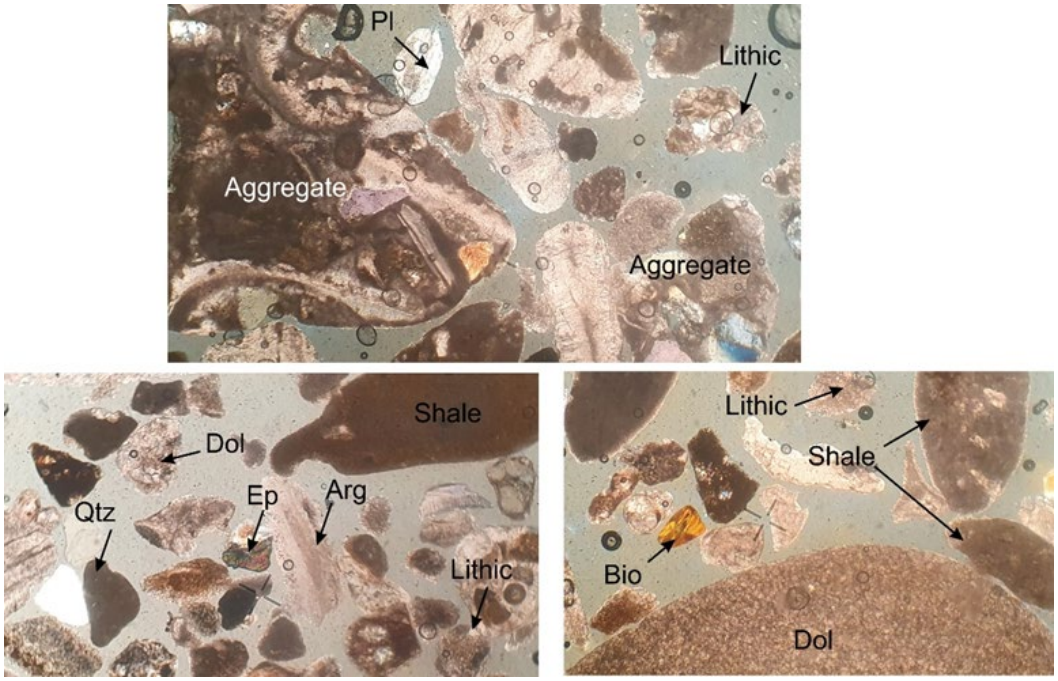


Fig. S 4.21. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Ziarat station. Dol: Dolomite, Qtz: Quartz, Arg: Aragonite Ep: Epidote, Pl: Plagioclase.

Fig. S 4.22. Binocular microscopy image for Ziarat costal sediment with magnifier 11.5X. Ep: Epidote, Qtz: Quartz.

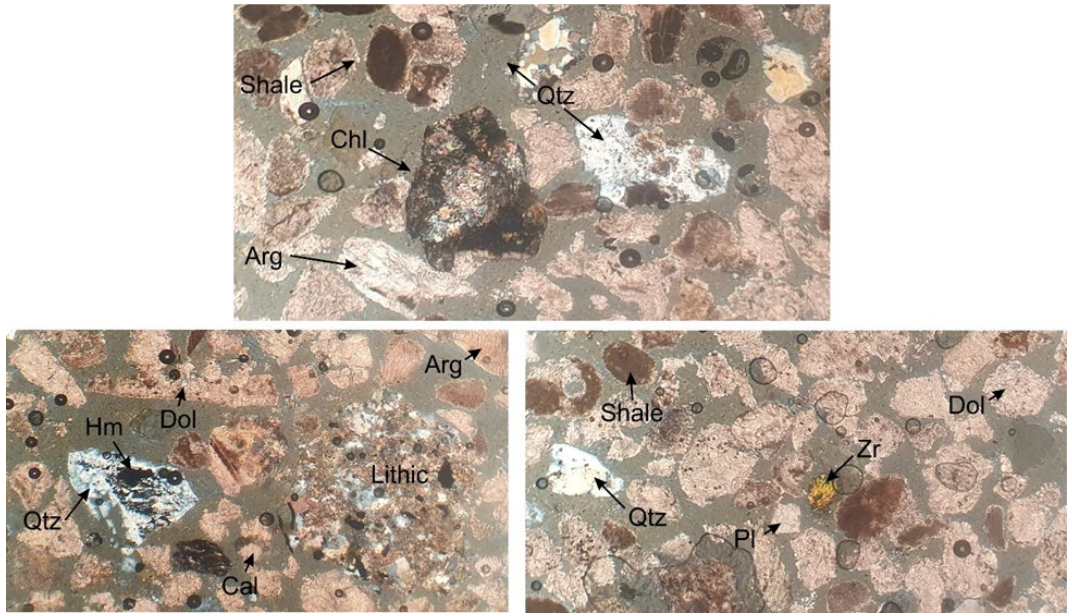


Fig. S 4.23. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Faror station. Dol: Dolomite, Qtz: Quartz, Arg: Aragonite Ep: Epidote, Pl: Plagioclase, Zr: Zircon, Hm: Hematite, Cal: Calcite, Chl: Chlorite.

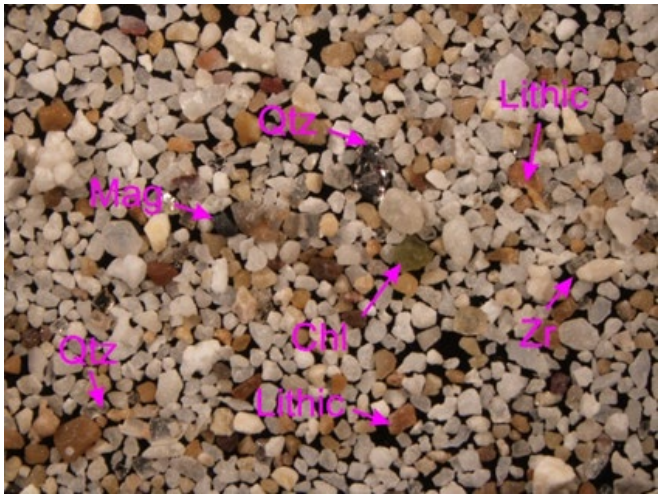


Fig. S 4.24.Binocular microscopy image for Faror costal sediment with magnifier 11.5X. Chl: Chlorite, Qtz: Quartz, Mag: Magnetic, Zr: Zircon.

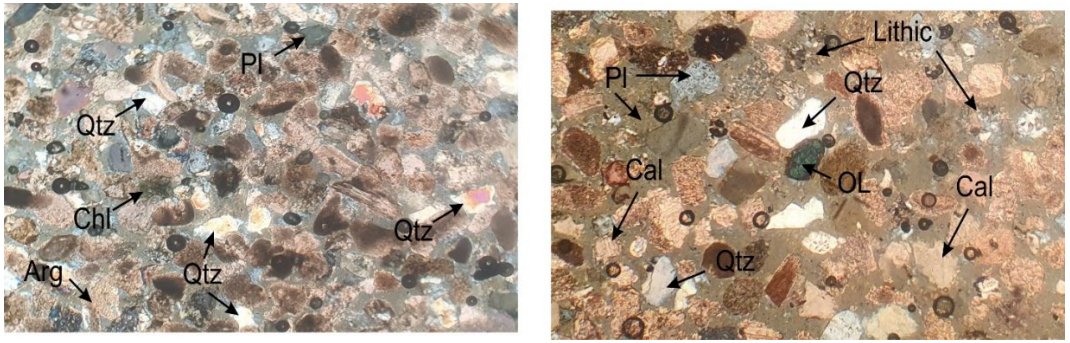


Fig. S 4.25. Thin section photo under cross-polarized light with magnifier 75X for coastal sediment of Kangan station. Qtz: Quartz, Arg: Aragonite, Pl: Plagioclase, Cal: Calcite, Ol: Olivine, Chl: Chlorite.

Fig. S 4.26. Binocular microscopy image for Kangan costal sediment with magnifier 11.5X.

Supplementary Figures 5, Microscopy studies of marine surface samples

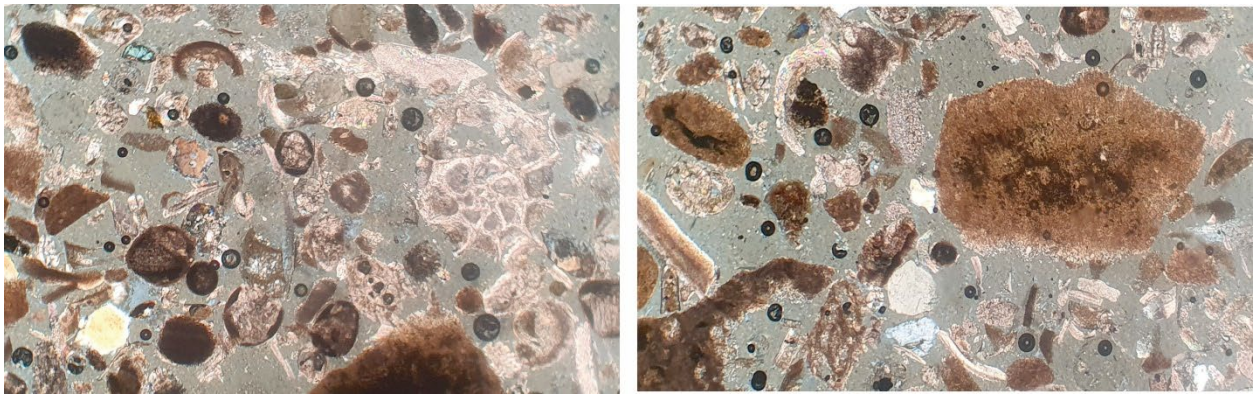


Fig. S 5.1. Thin section photo under cross-polarized light with magnifier 75X for sample 54.

Fig. S 5.2. Binocular microscopy image for sample 54 with magnifier 11 X.

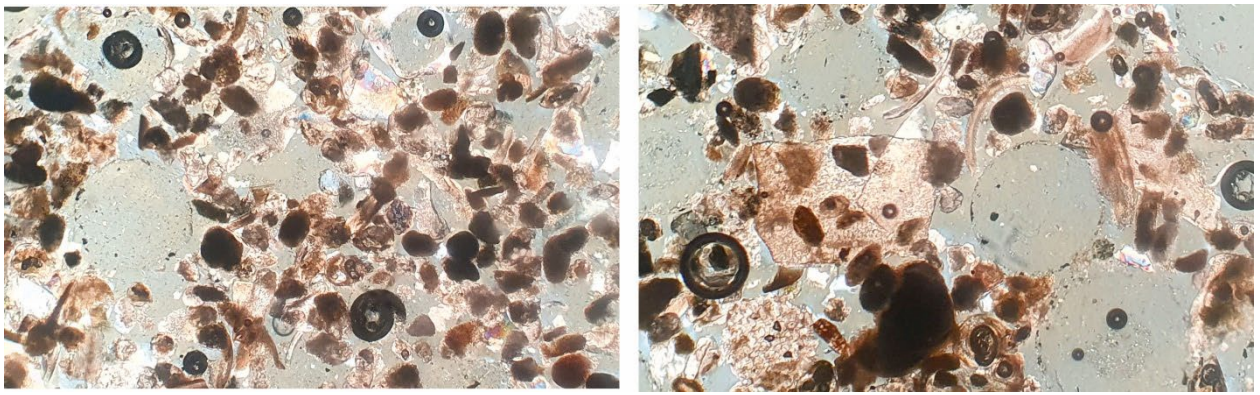


Fig. S 5.3. Thin section photo under cross-polarized light with magnifier 75X for sample 56.

Fig. S 5.4. Binocular microscopy image for sample 56 with magnifier 13 X.

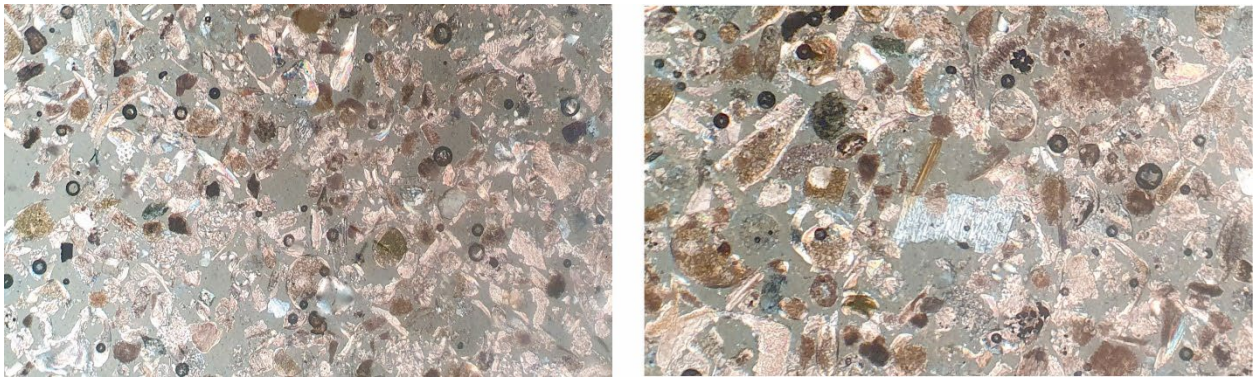
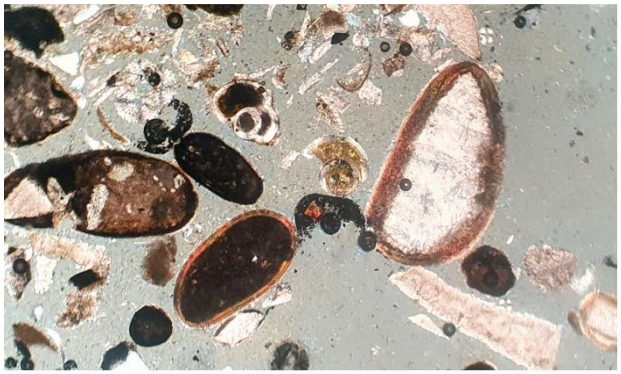


Fig. S 5.5. Thin section photo under cross-polarized light with magnifier 75X for sample 88.

Fig. S 5.6. Binocular microscopy image for sample 88 with magnifier 13 X.

Fig. S 5.7. Binocular microscopy image for sample 92 with magnifier 12 X.



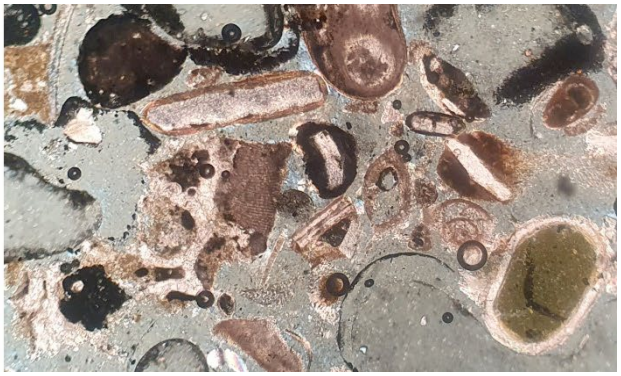


Fig. S 5.8. Thin section photo under cross-polarized light with magnifier 75X for sample 114.

Fig. S 5.9. Binocular microscopy image for sample 114 with magnifier 11 X.

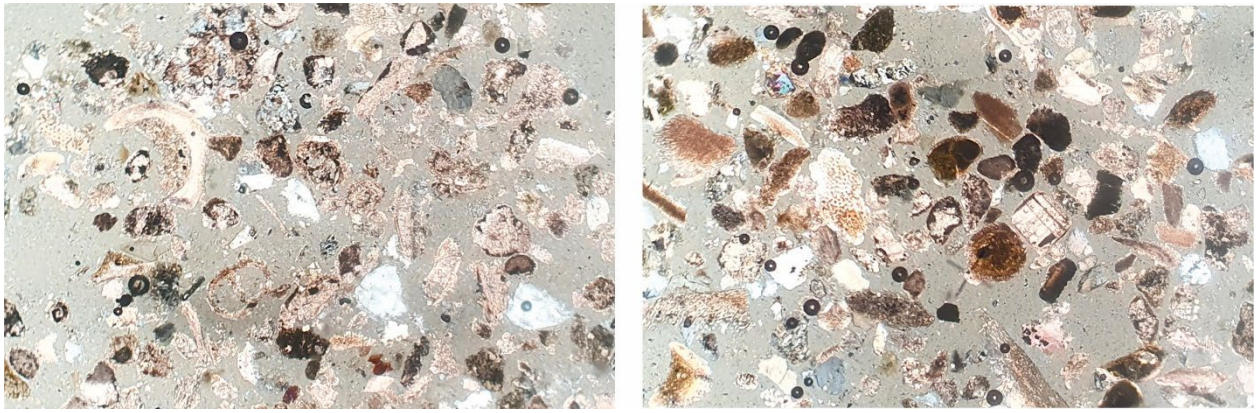


Fig. S 5.10. Thin section photo under cross-polarized light with magnifier 75X for sample 121.

Fig. S 5.11. Binocular microscopy image for sample 121 with magnifier 12 X.

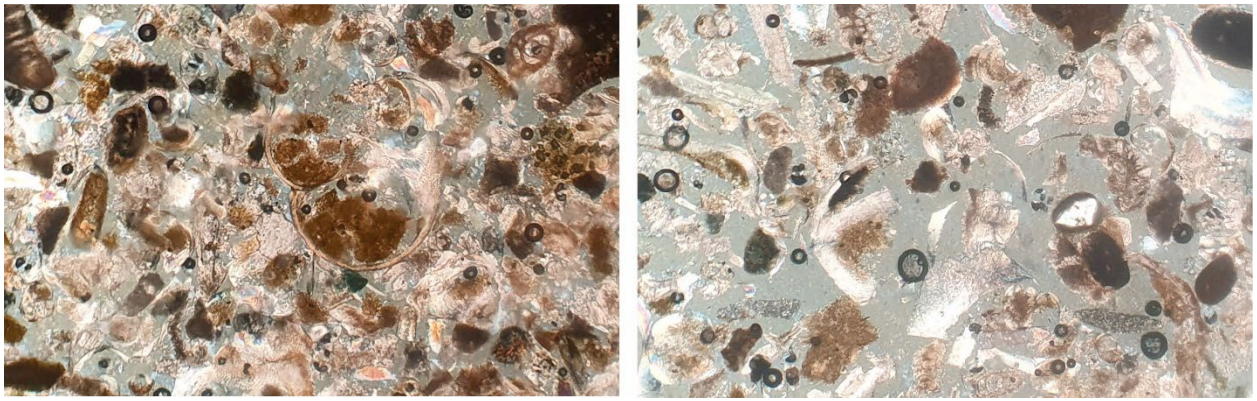


Fig. S 5.12. Thin section photo under cross-polarized light with magnifier 75X for sample J.

Fig. S 5.13. Binocular microscopy image for sample J with magnifier 10.75 X.

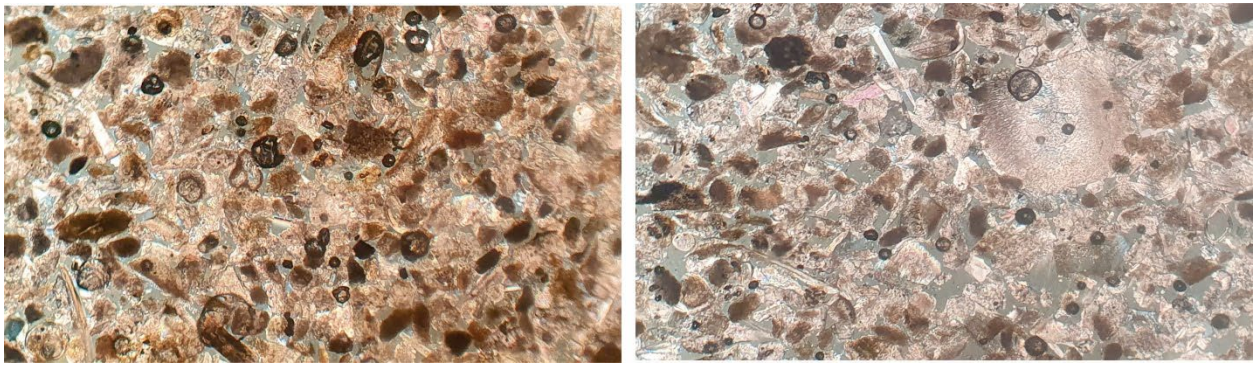


Fig. S 5.14. Thin section photo under cross-polarized light with magnifier 75X for sample 26.

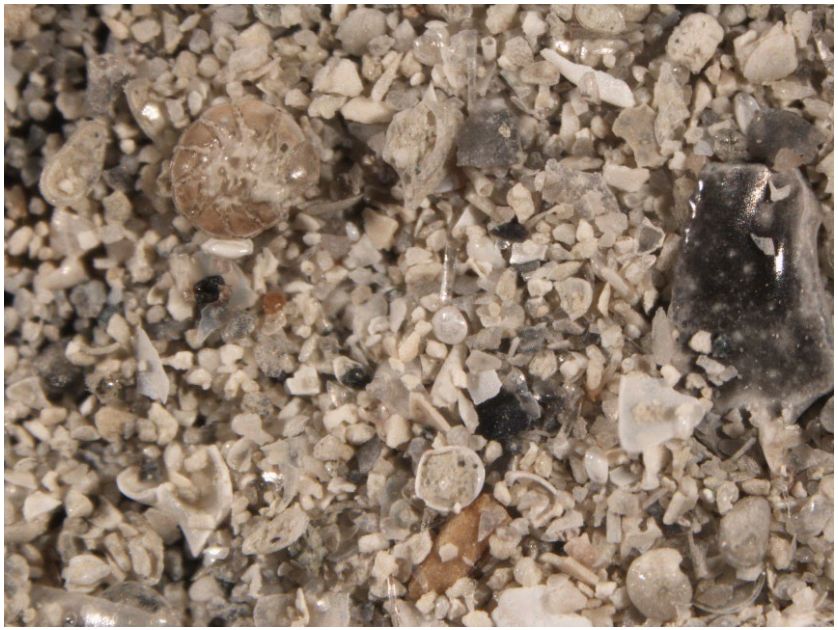


Fig. S 5.15. Binocular microscopy image for sample 26 with magnifier 12 X.

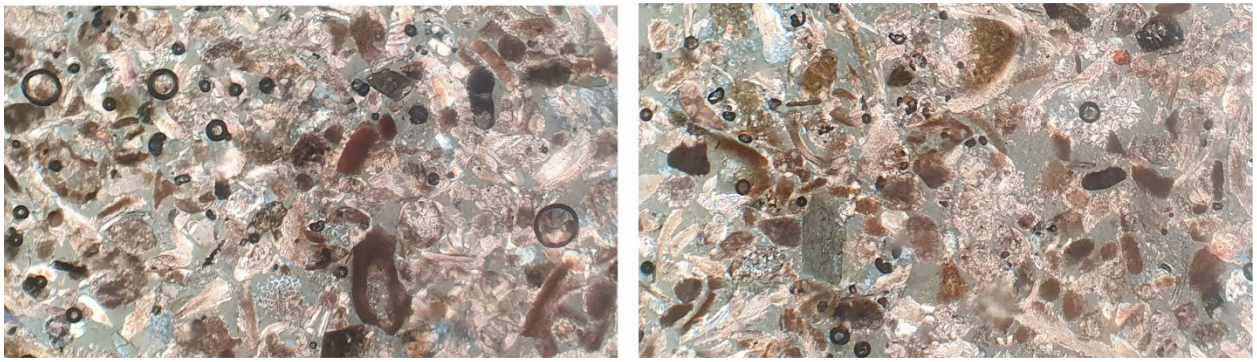


Fig. S 5.16. Thin section photo under cross-polarized light with magnifier 75X for sample 28.

Fig. S 5.17. Binocular microscopy image for sample 28 with magnifier 11.5 X.

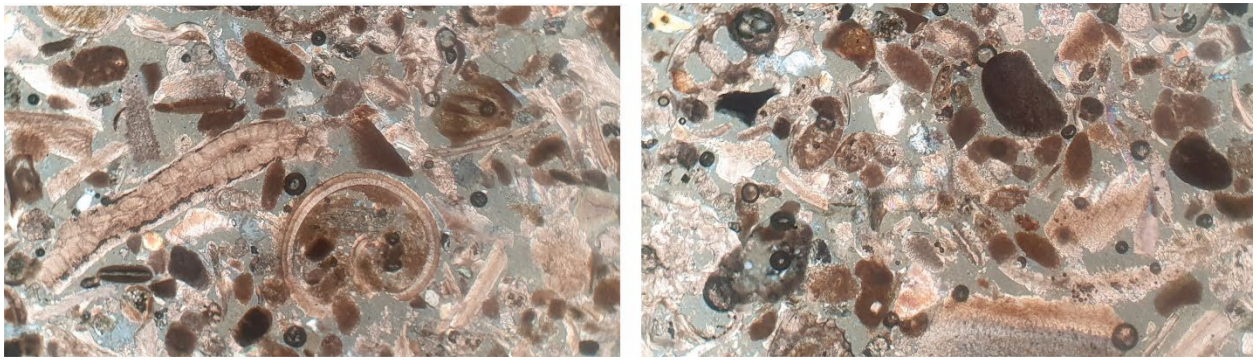


Fig. S 5.18. Thin section photo under cross-polarized light with magnifier 75X for sample 30.

Fig. S 5.19. Binocular microscopy image for sample 30 with magnifier 11.5 X.

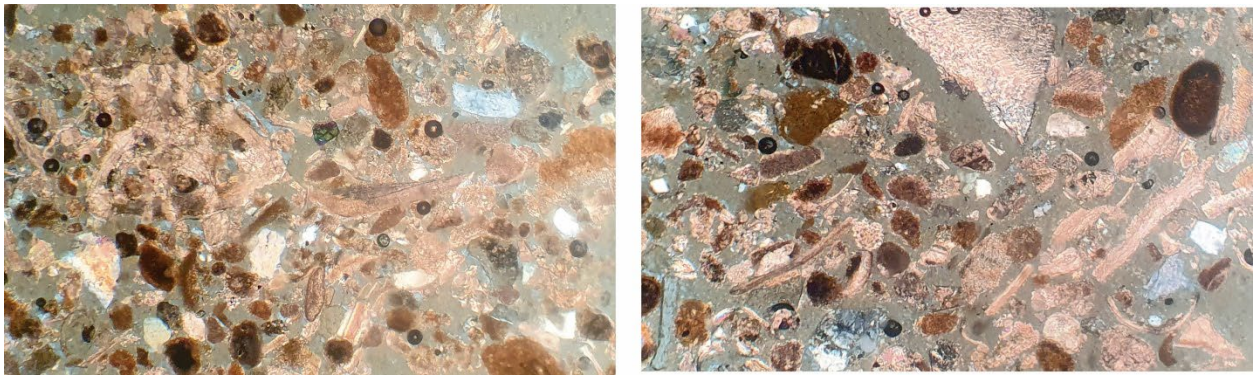


Fig. S 5.20. Thin section photo under cross-polarized light with magnifier 75X for sample 44.

Fig. S 5.21. Binocular microscopy image for sample 44 with magnifier 11 X.

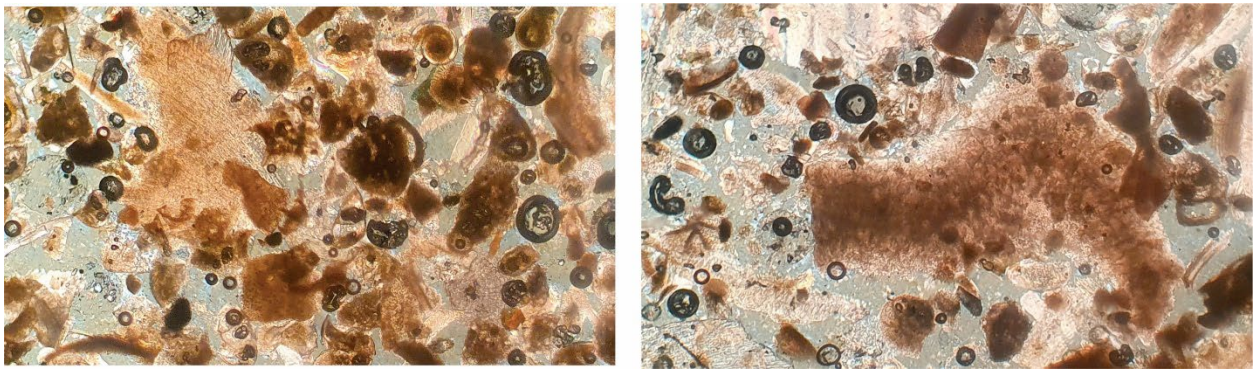


Fig. S 5.22. Thin section photo under cross-polarized light with magnifier 75X for sample 51.

Fig. S 5.23. Binocular microscopy image for sample 51 with magnifier 11.5 X.

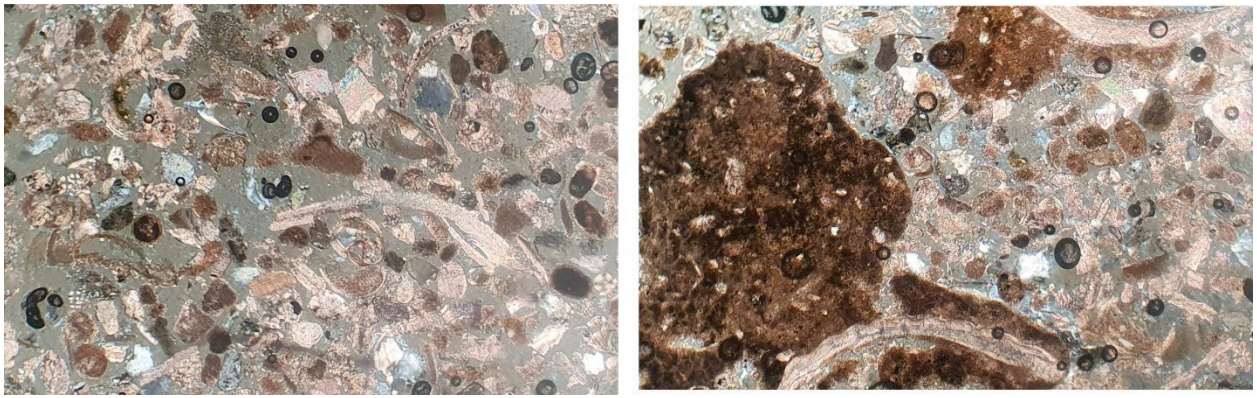


Fig. S 5.24. Thin section photo under cross-polarized light with magnifier 75X for sample 62.

Fig. S 5.25. Binocular microscopy image for sample 62 with magnifier 11.5 X.

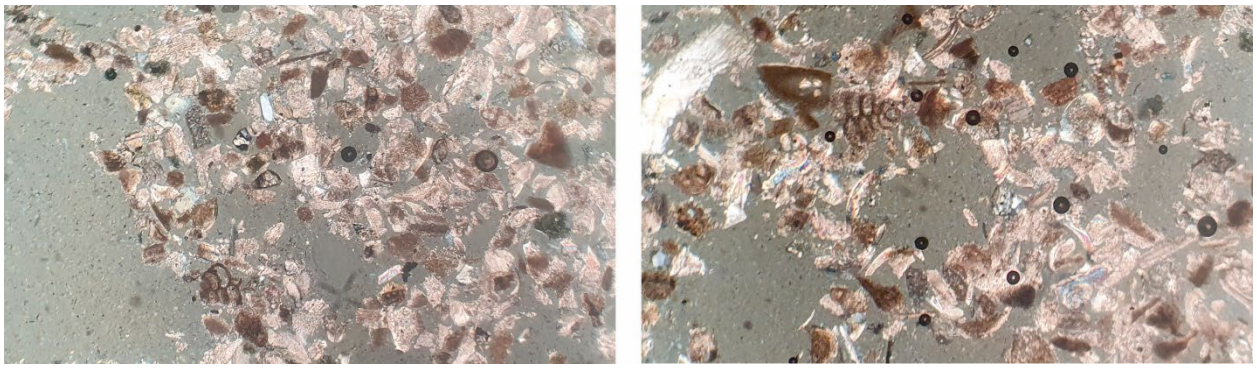


Fig. S 5.26. Thin section photo under cross-polarized light with magnifier 75X for sample 84.

Fig. S 5.27. Binocular microscopy image for sample 84 with magnifier 11.5 X.

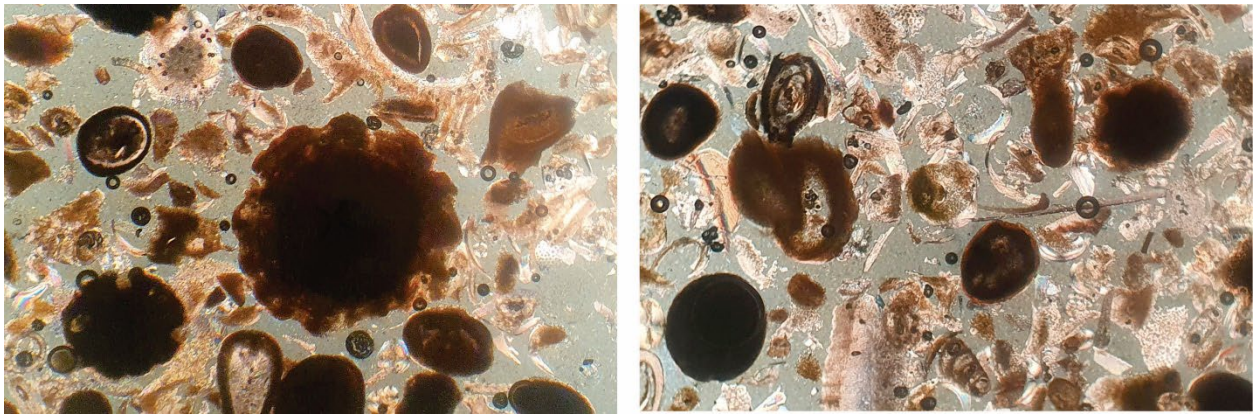


Fig. S 5.28. Thin section photo under cross-polarized light with magnifier 75X for sample 90.

Fig. S 5.29. Binocular microscopy image for sample 90 with magnifier 0.75 X.

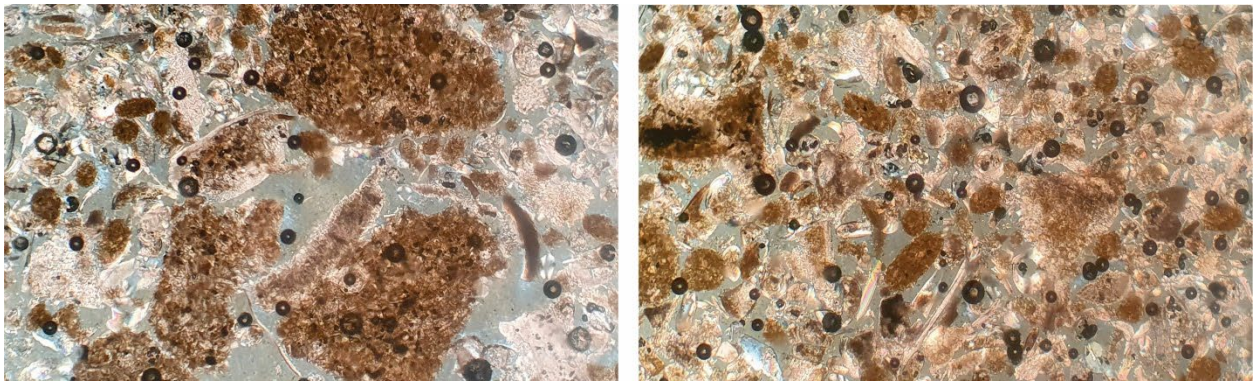


Fig. S 5.30. Thin section photo under cross-polarized light with magnifier 75X for sample 104.

Fig. S 5.31. Binocular microscopy image for sample 104 with magnifier 12 X.

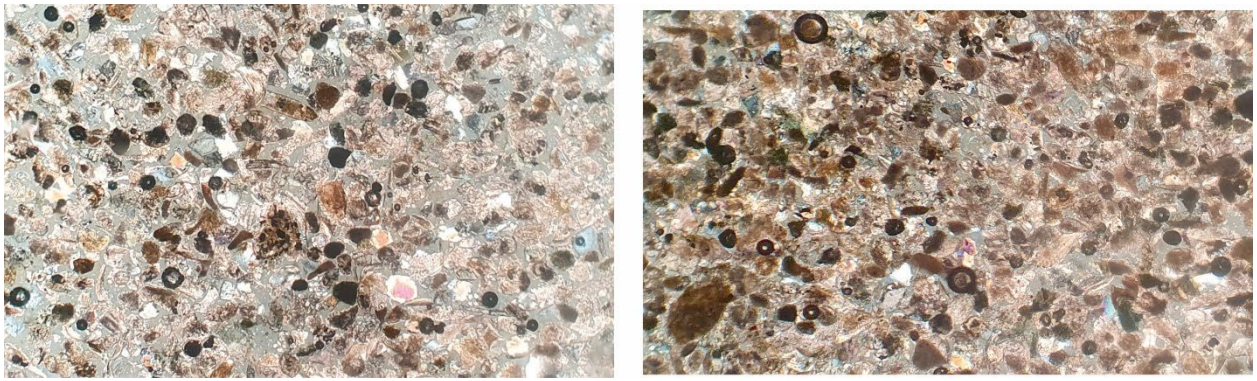


Fig. S 5.32. Thin section photo under cross-polarized light with magnifier 75X for sample 108.

Fig. S 5.33. Binocular microscopy image for sample 108 with magnifier 12 X.

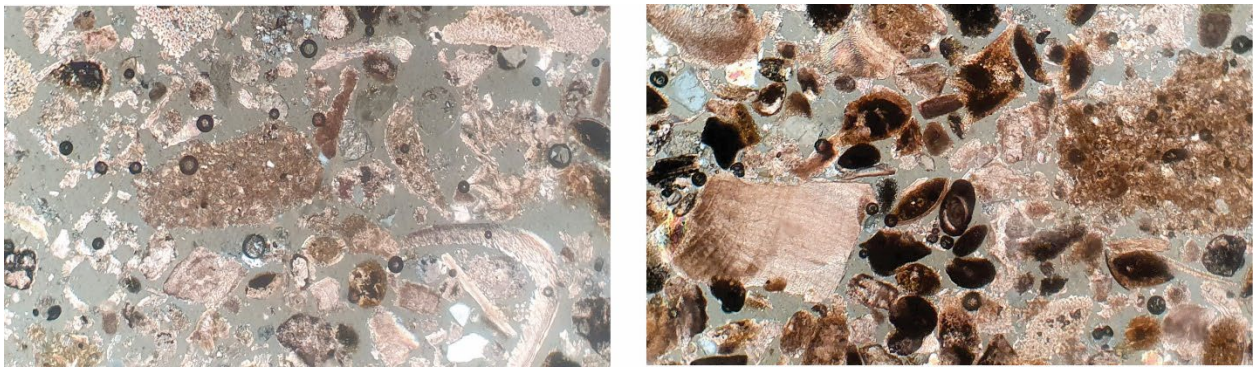


Fig. S 5.34. Thin section photo under cross-polarized light with magnifier 75X for sample 116.

Fig. S 5.35. Binocular microscopy image for sample 116 with magnifier 11.5 X.

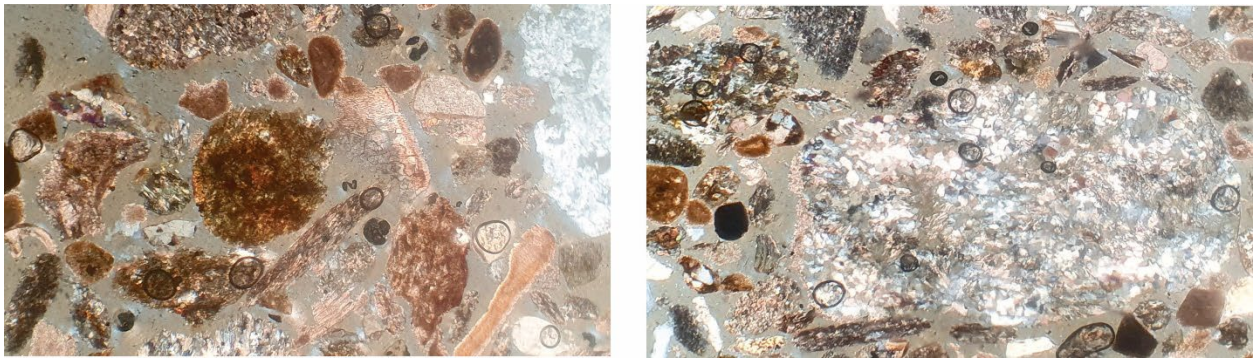


Fig. S 5.36. Thin section photo under cross-polarized light with magnifier 75X for sample 118.

Fig. S 5.37. Binocular microscopy image for sample 118 with magnifier 11.5 X.

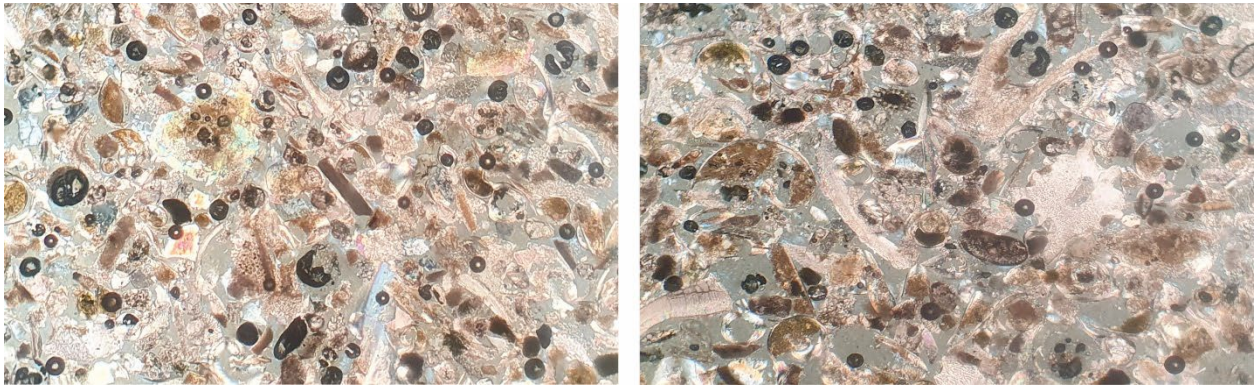


Fig. S 5.38. Thin section photo under cross-polarized light with magnifier 75X for sample 123.

Fig. S 5.39. Binocular microscopy image for sample 123 with magnifier 11.5 X.

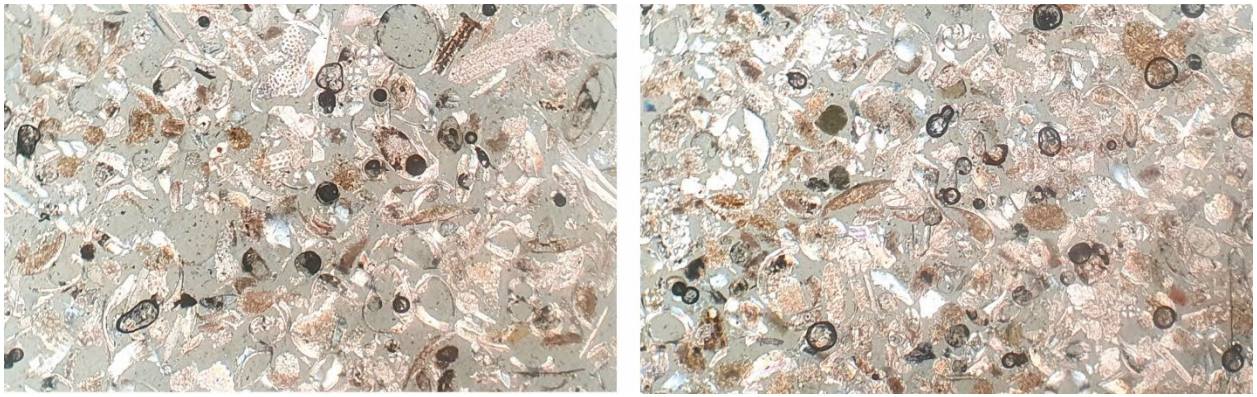


Fig. S 5.40. Thin section photo under cross-polarized light with magnifier 75X for sample J-136.

Fig. S 5.41. Binocular microscopy image for sample 126 with magnifier 12 X.

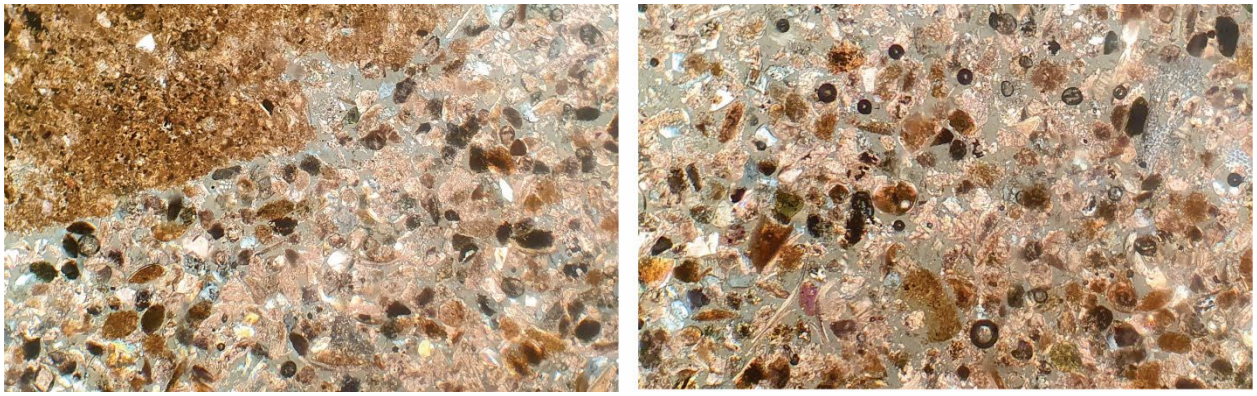


Fig. S 5.42. Thin section photo under cross-polarized light with magnifier 75X for sample TS.

Fig. S 5.43. Binocular microscopy image for sample TS with magnifier 11 X.

Fig. S 5.44. Binocular microscopy image for sample D with magnifier 12 X.

Supplementary Figures 6, Core St 99, stratigraphy and XRF

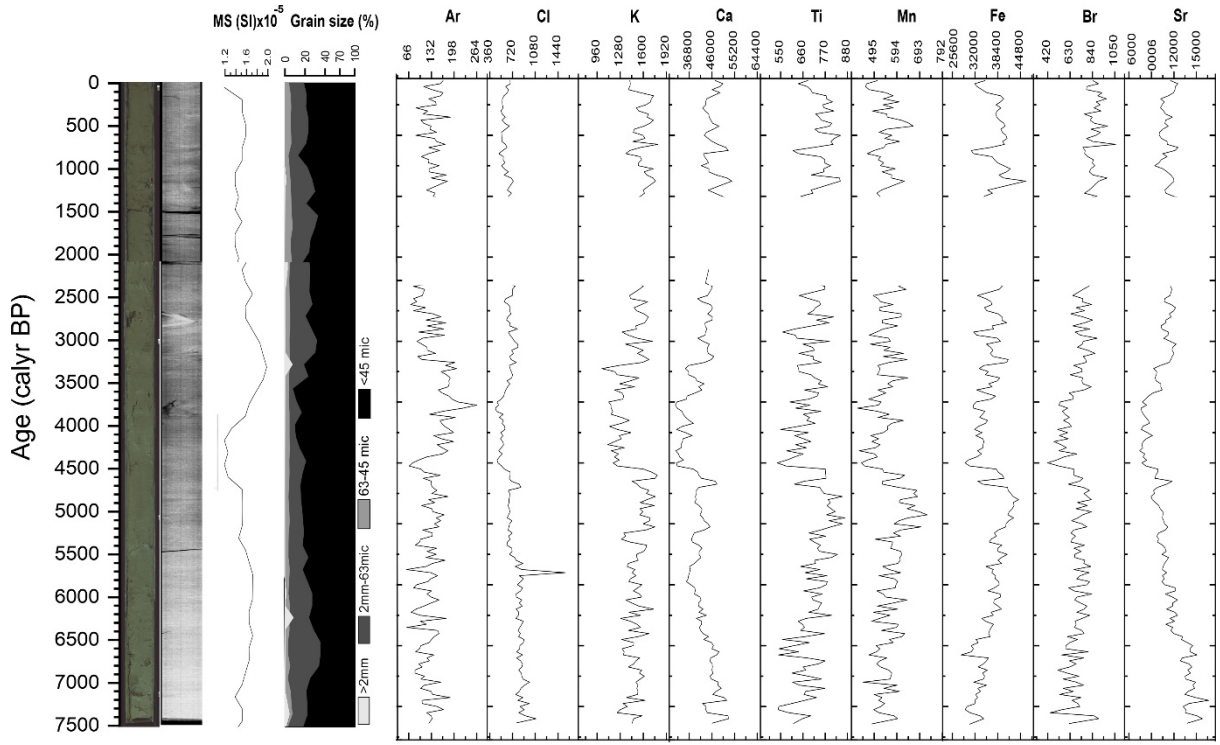


Fig. S 6.1. X-ray photograph, MS, lithostratigraphy and x-ray core scanner data for Core St99

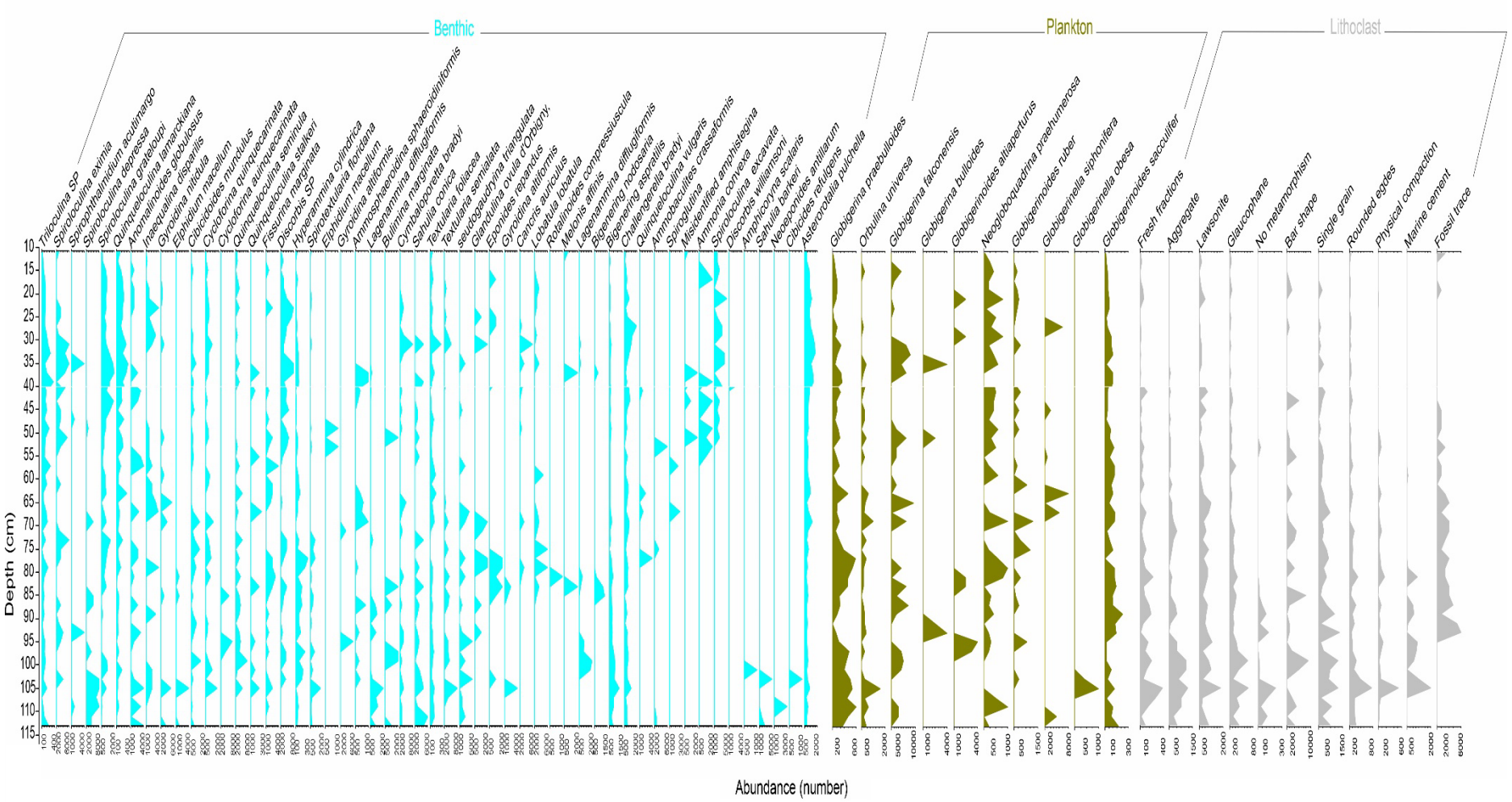


Fig. S 6.2. Biostratigraphy and abundance of lithoclast in the core St9

Supplementary Figures 7, Core St 99 Lithocalsts Photo

Fig. S 7.1. Binocular microscopy photo with magnifier 10X for 36-38 cm. Fine lithoclast fractions are generally made of fossil particles with rounded edges.

Fig. S 7.2. Binocular microscopy photo with magnifier 10X for 67-69 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.3. Binocular microscopy photo with magnifier 10X for 69-71 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of aggregate and fossil fractions.

Fig. S 7.4. Binocular microscopy photo with magnifier 10X for 71-73 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, aggregate and fossil fractions.

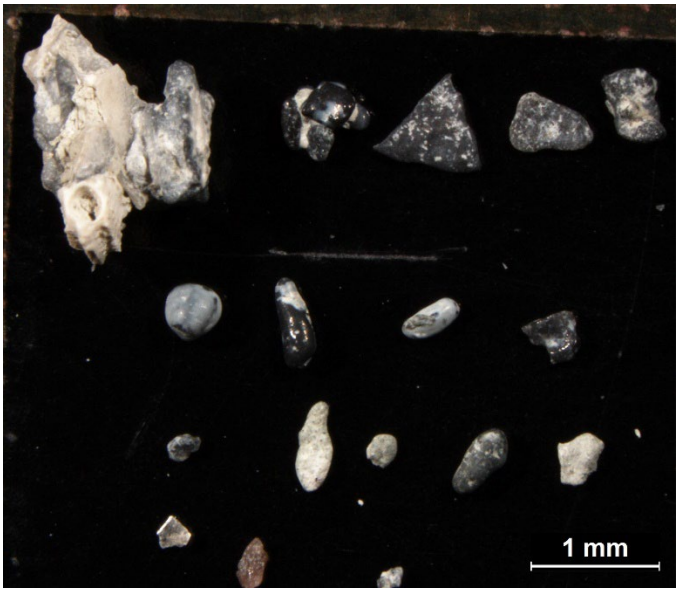


Fig. S 7.5. Binocular microscopy photo with magnifier 10X for 73-75 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, aggregate and fossil fractions.

Fig. S 7.6. Binocular microscopy photo with magnifier 10X for 75-55 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

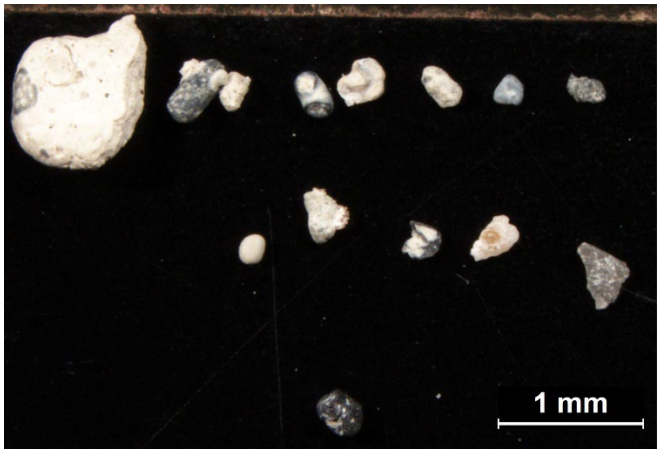


Fig. S 7.7. Binocular microscopy photo with magnifier 10X for 77-79 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of marine cement and aggregate.

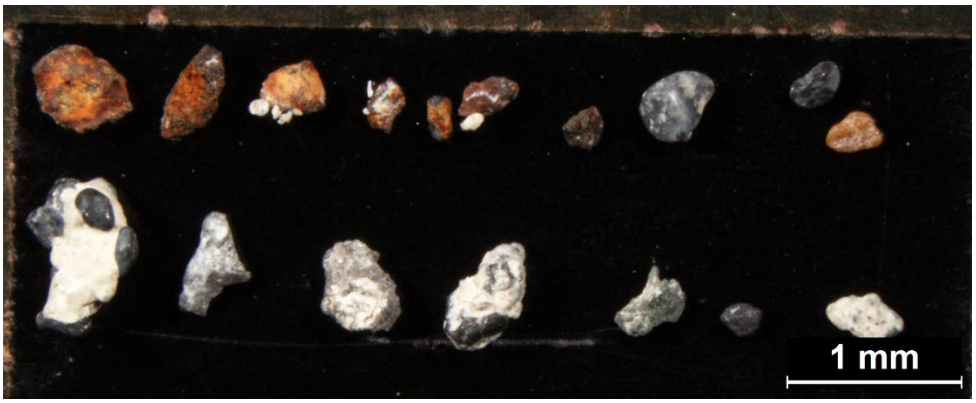


Fig. S 7.8. Binocular microscopy photo with magnifier 10X for 79-81 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of marine cement, aggregate with limonite pigments.

Fig. S 7.9. Binocular microscopy photo with magnifier 10X for 81-83 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.10. Binocular microscopy photo with magnifier 10X for 83-85 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

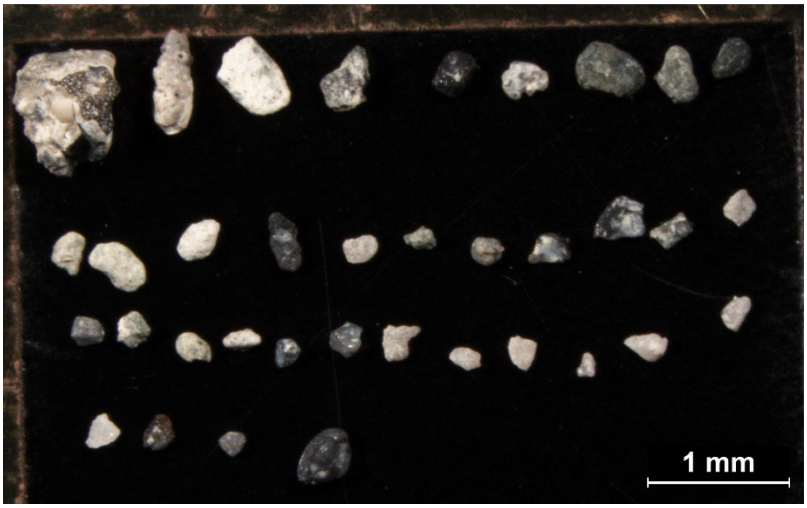


Fig. S 7.11. Binocular microscopy photo with magnifier 10X for 85-87 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of marine cement, aggregate and fossil fractions.

Fig. S 7.12. Binocular microscopy photo with magnifier 10X for 87-89 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of marine cement, aggregate and fossil fractions.

Fig. S 7.13. Binocular microscopy photo with magnifier 10X for 67-69 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.14. Binocular microscopy photo with magnifier 10X for 91-93 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of marine cement, aggregate and fossil fractions.

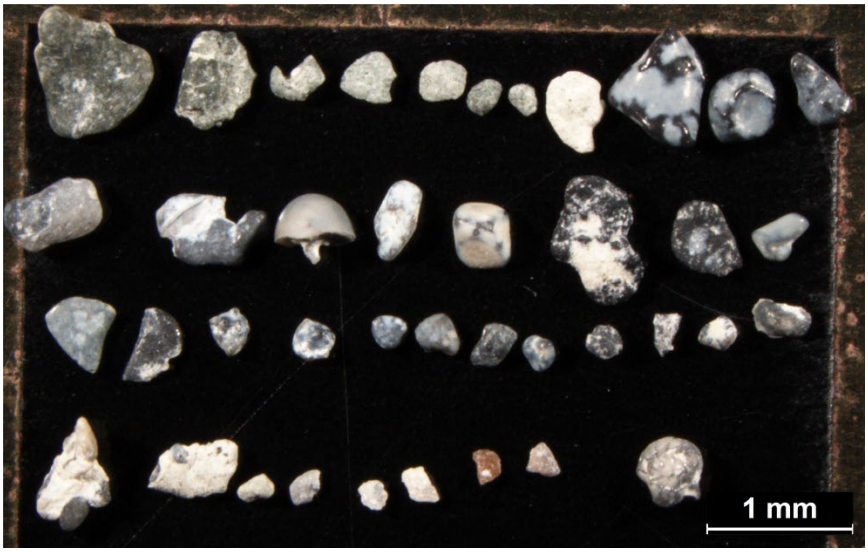


Fig. S 7.15. Binocular microscopy photo with magnifier 10X for 93-95 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.16. Binocular microscopy photo with magnifier 10X for 95-97 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

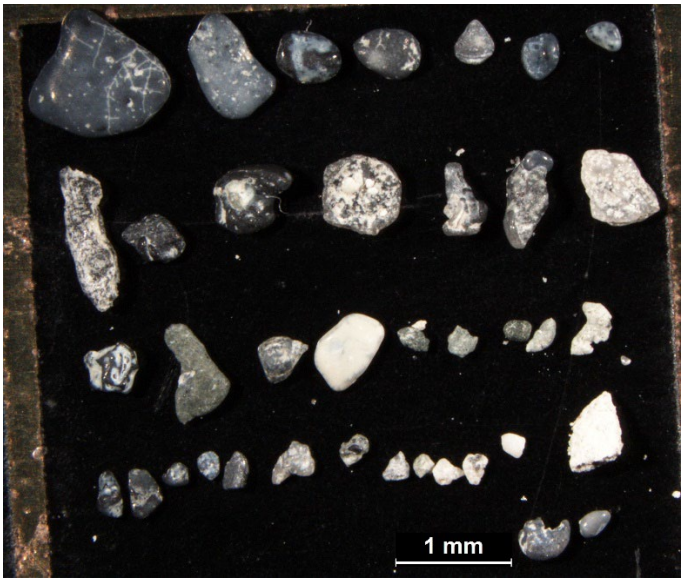


Fig. S 7.17. Binocular microscopy photo with magnifier 10X for 97-99 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.18. Binocular microscopy photo with magnifier 10X for 99-101 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of Lawsonite, Glaucophane, marine cement, aggregate and fossil fractions.

Fig. S 7.19. Binocular microscopy photo with magnifier 10X for 101-103 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

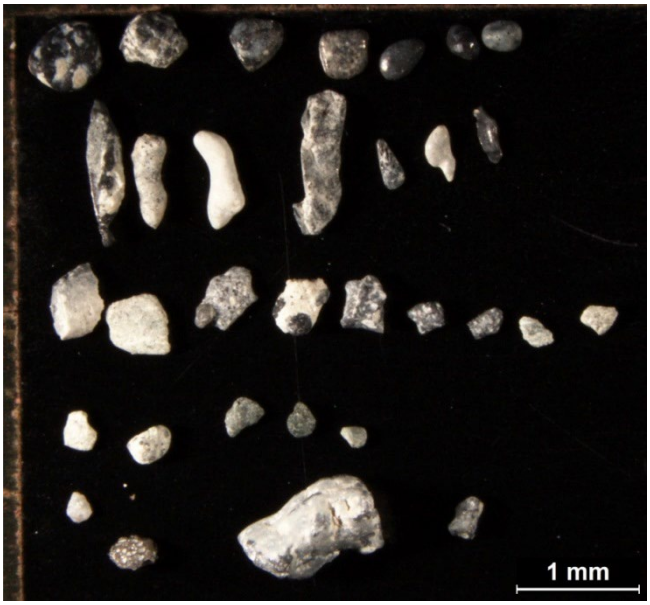


Fig. S 7.20. Binocular microscopy photo with magnifier 10X for 103-105 cm. Variety lithoclasts with different shapes are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.21. Binocular microscopy photo with magnifier 10X for 105-107 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.22. Binocular microscopy photo with magnifier 10X for 107-109 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.23. Binocular microscopy photo with magnifier 10X for 109-111 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

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Fig. S 7.24. Binocular microscopy photo with magnifier 10X for 111-113 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, Glaucophane, marine cement, aggregate and fossil fractions.

Fig. S 7.25. Binocular microscopy photo with magnifier 10X for 113-115 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.26. Binocular microscopy photo with magnifier 10X for 115-117 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.27. Binocular microscopy photo with magnifier 10X for 117-119 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.27. Binocular microscopy photo with magnifier 10X for 119-121 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Fig. S 7.28. Binocular microscopy photo with magnifier 10X for 121-123 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

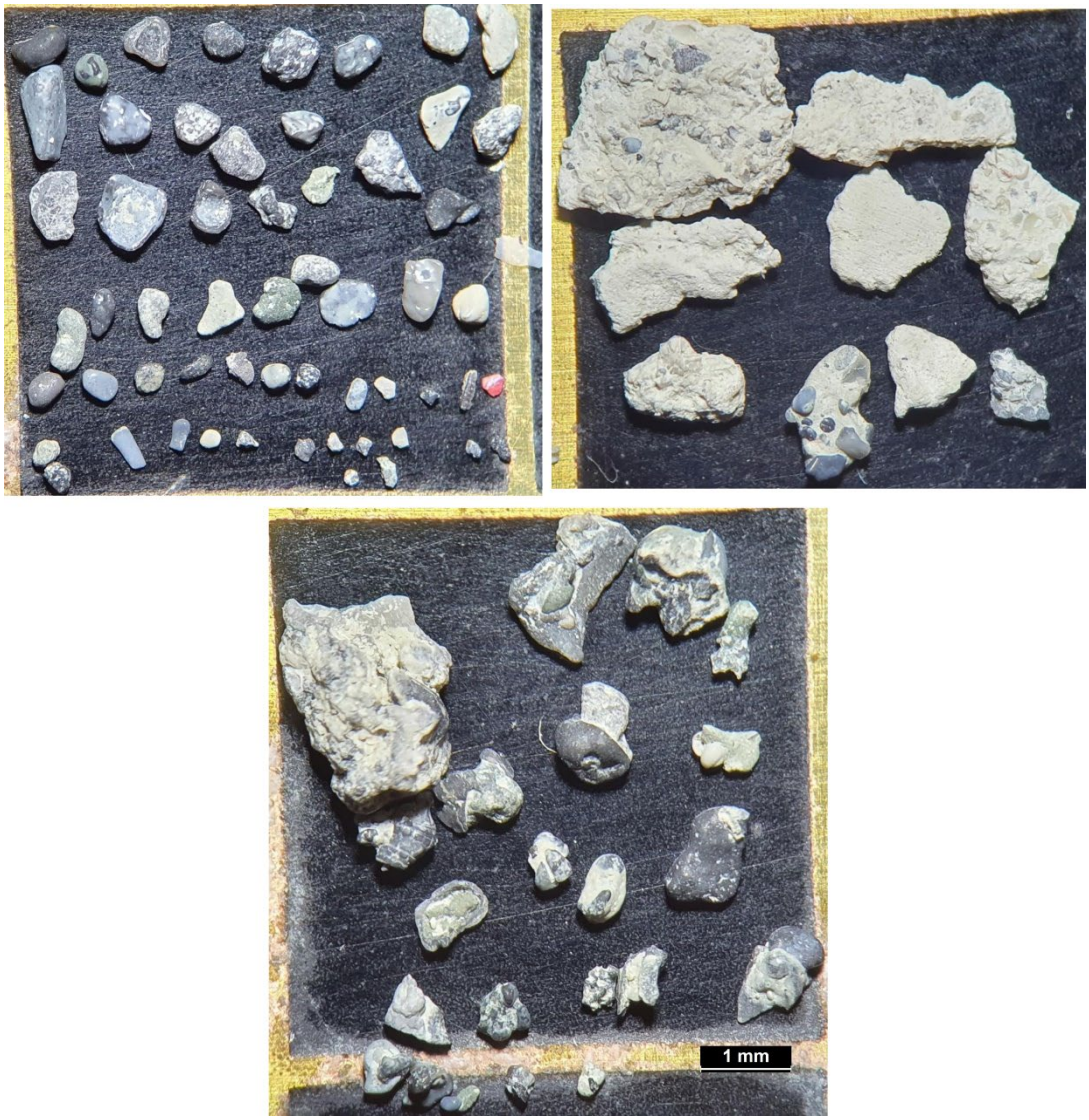


Fig. S 7.29. Binocular microscopy photo with magnifier 10X for 123-125 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, fossil fractions, coarse marine cement and aggregate.

Fig. S 7.30. Binocular microscopy photo with magnifier 10X for 125127 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, aggregate and fossil fractions.

Fig. S 7.31. Binocular microscopy photo with magnifier 10X for 127-129 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

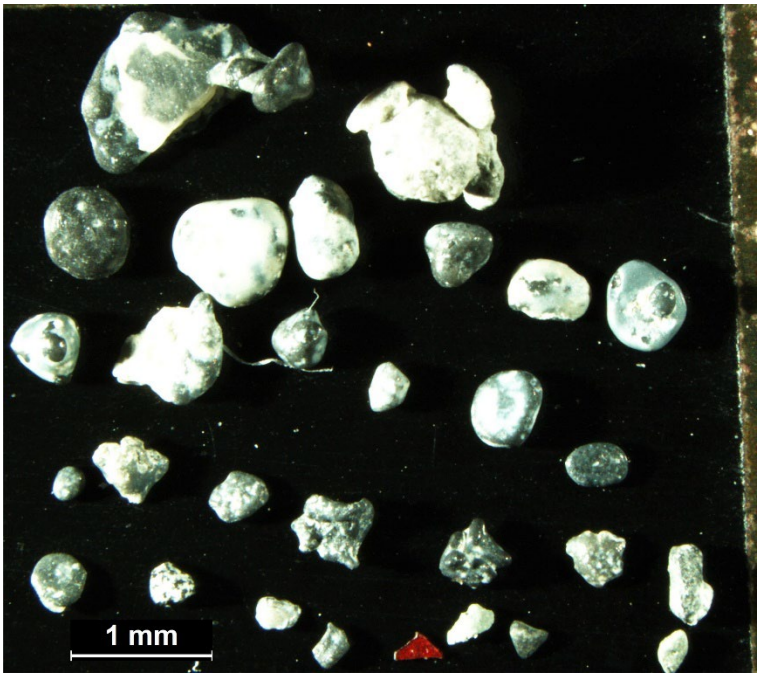


Fig. S 7.32. Binocular microscopy photo with magnifier 10X for 131-133 cm. Variety lithoclasts with different shapes and size are observed in this horizon. The lithoclasts are generally made of Lawsonite, marine cement, aggregate and fossil fractions.

Supplementary figures 8, SEM-EDS

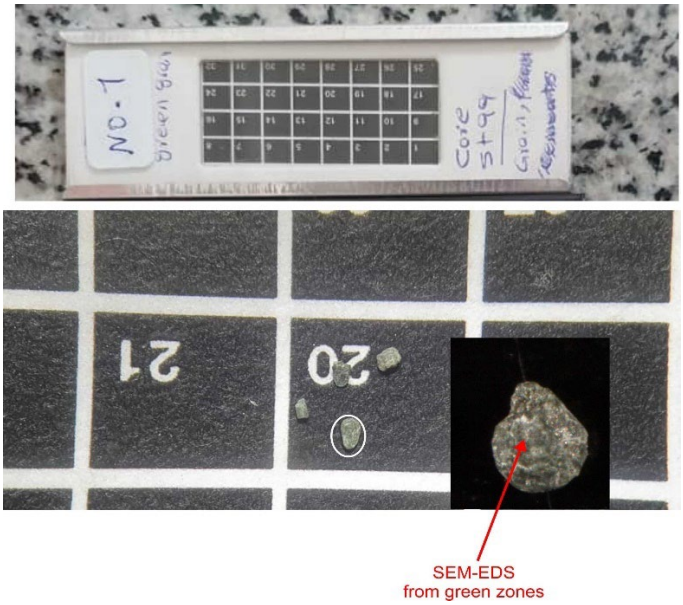


Fig. S 8.1. Binocular microscopy image of four green lithoclasts from the core st99 horizon at 67-69 cm. The lithoclast was selected for SEM-EDS analysis to determine its composition.

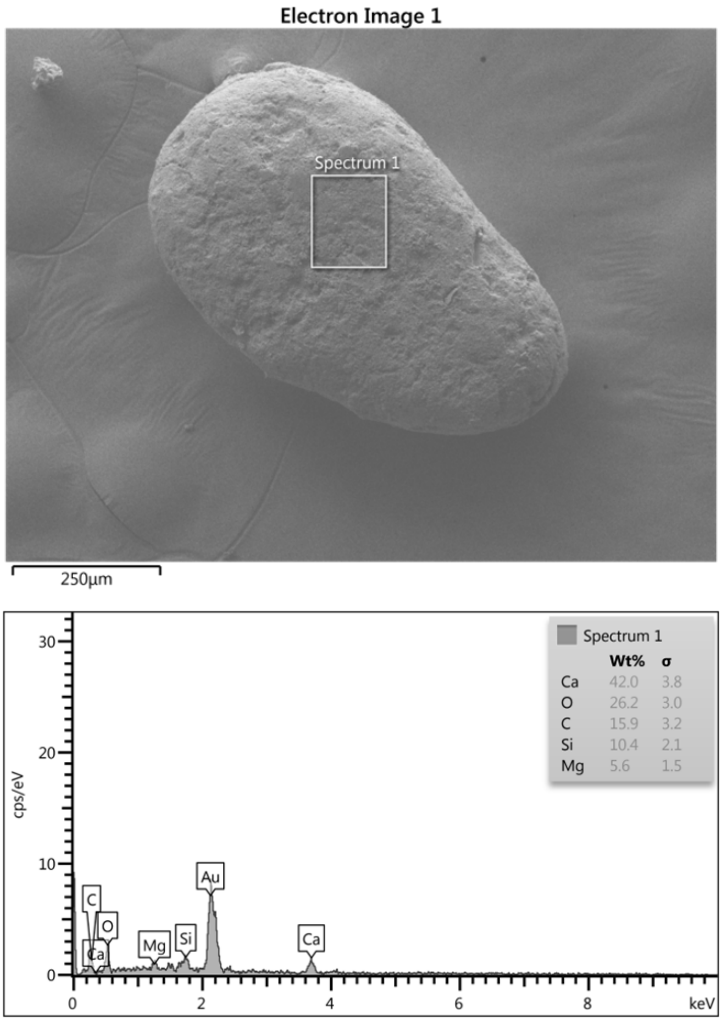


Fig. S 8.2. SEM-EDS result for lithoclast from 67-69 cm depth. It contains a large amount of high-magnesium calcite mixed with organic matter.

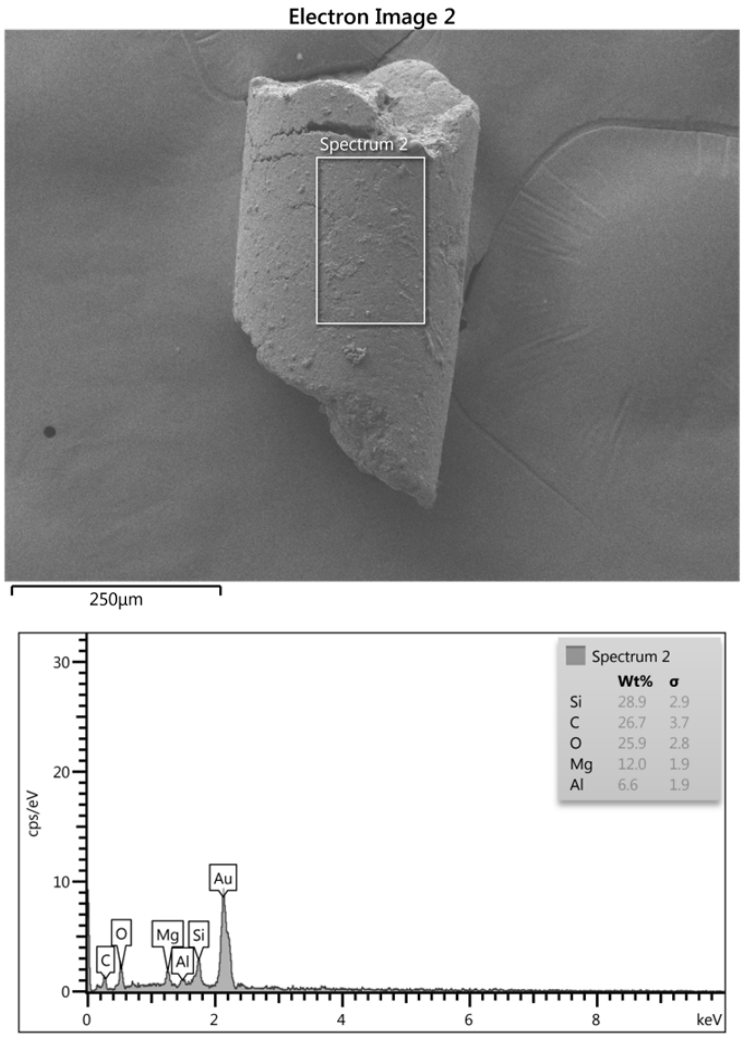
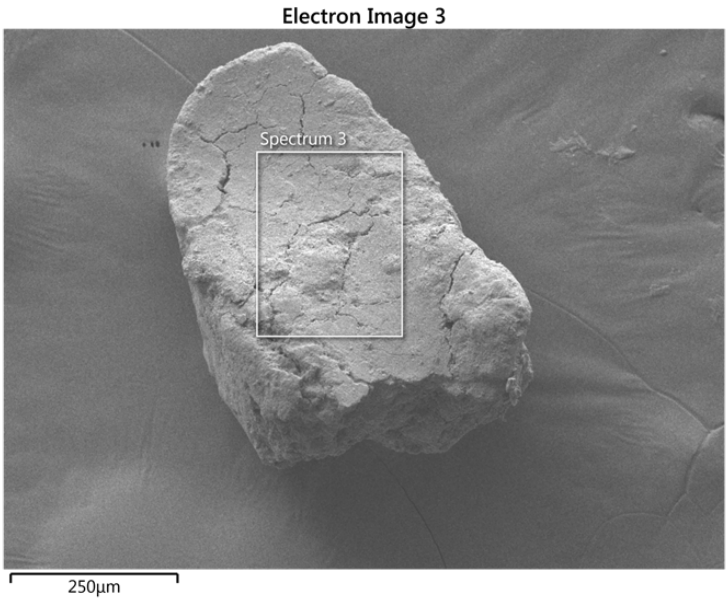


Fig. S 8.3. The SEM-EDS result for lithoclast from 67-69 cm depth. The lithoclast has a bar-like shape and consists of kaolinite with silica grains. This shape indicates that the kaolinite was plastically deformed.



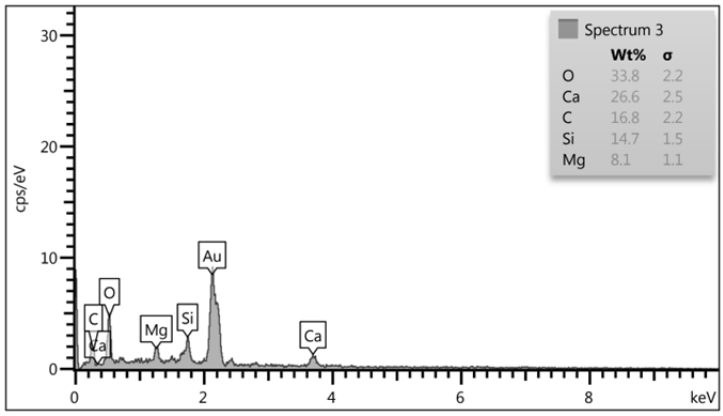


Fig. S 8.4. SEM-EDS result for lithoclast from 67-69 cm depth. The lithoclast has small craks and consists of kaolinite with silica grains.

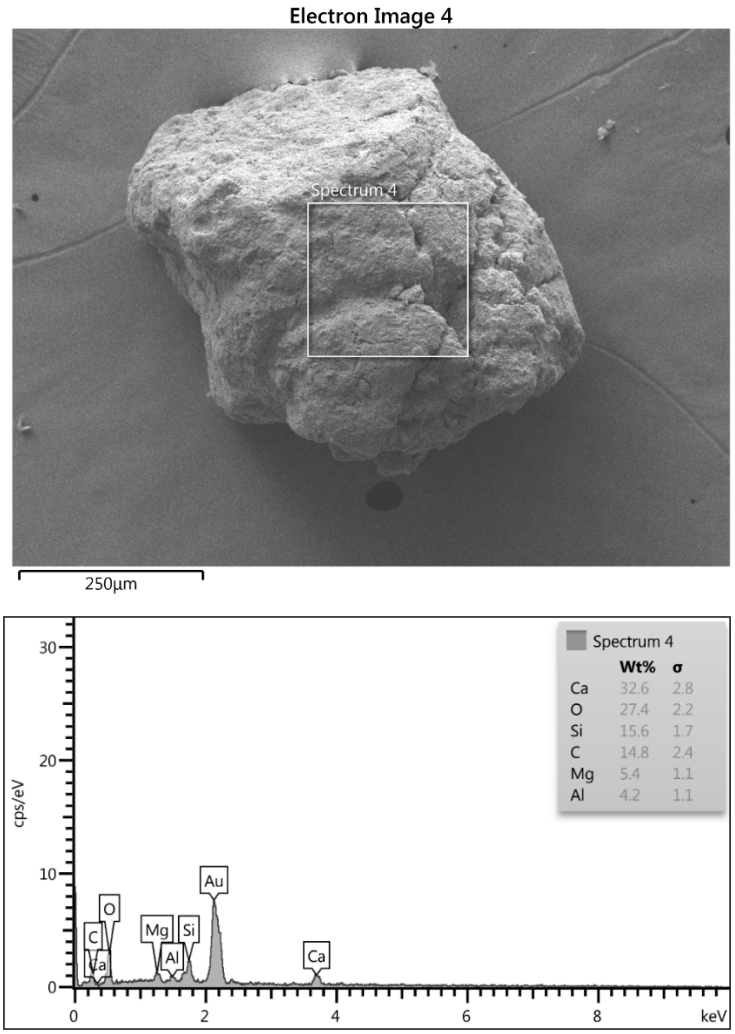


Fig. S 8.5. SEM-EDS result for lithoclast from 67-69 cm depth. The lithoclast consists of kaolinite with silica grains.

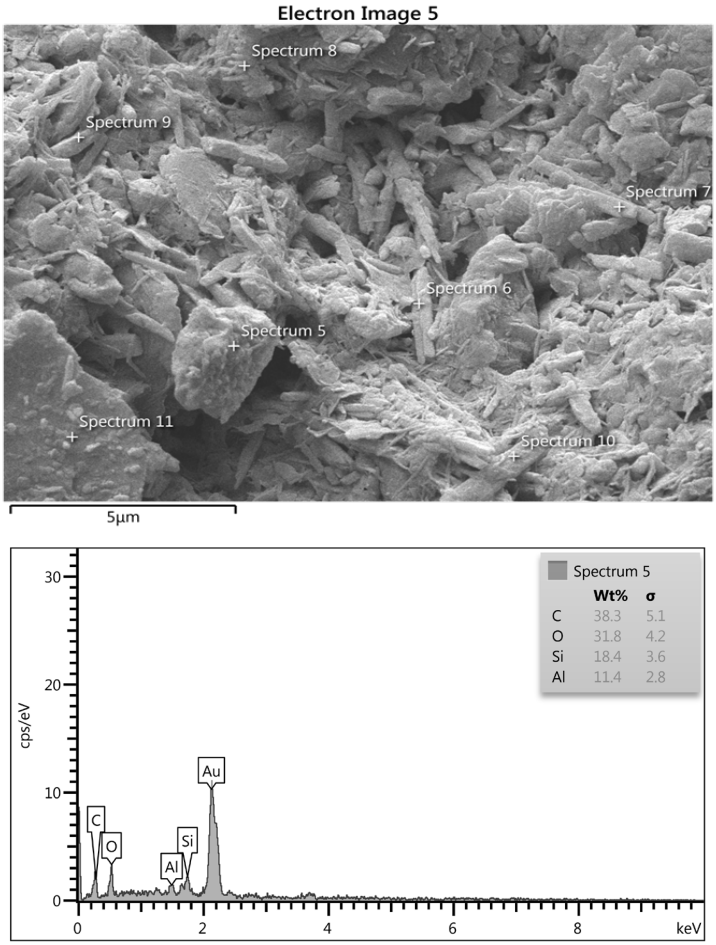


Fig. S 8.6. SEM image with magnifier 5µm for green lithoclast mentioned in Fig. S 8.5. EDS analysis for spectrum 5 suggested kaolinite mixed with organic matter.

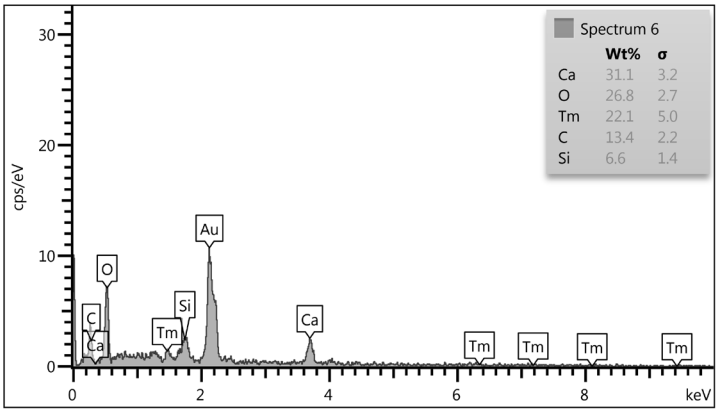


Fig. S 8.7. SEM image with magnifier 5µm for green lithoclast mentioned in Fig. S 8.5. EDS analysis for spectrum 6 suggested carbonate with Thulium (Tm).

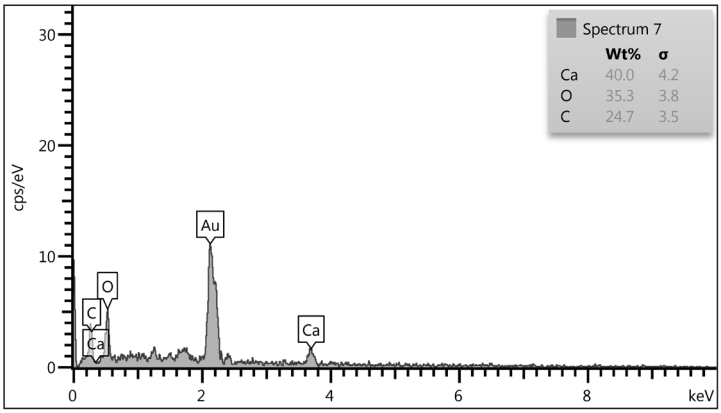


Fig. S 8.8. SEM image with magnifier 5µm for green lithoclast mentioned in Fig. S 8.5. EDS analysis for spectrum 7 suggested carbonate mixed with organic matter.

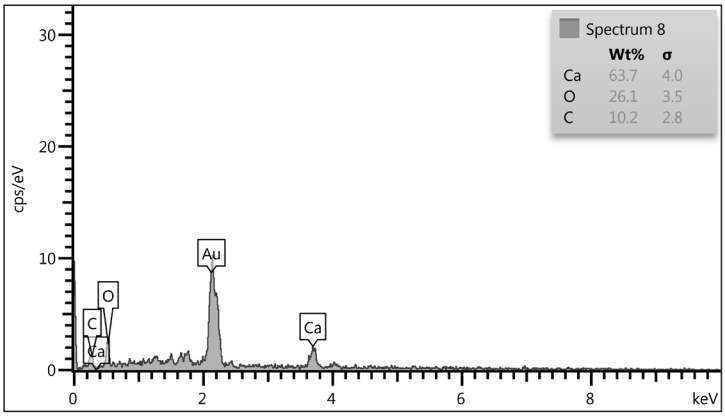


Fig. S 8.9. SEM image with magnifier 5µm for green lithoclast mentioned in Fig. S 8.5. EDS analysis for spectrum 8 suggeested carbonate mixed with organic matter.

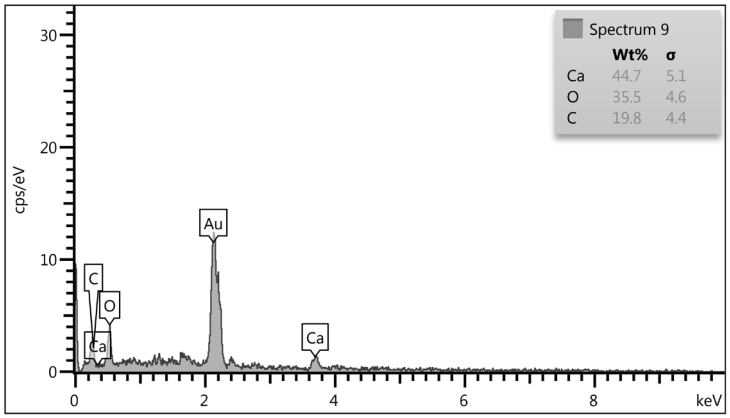


Fig. S 8.10. SEM image with magnifier 5µm for green lithoclast mentioned in Fig. S 8.5. EDS analysis for spectrum 9 suggested carbonate mixed with organic matter.

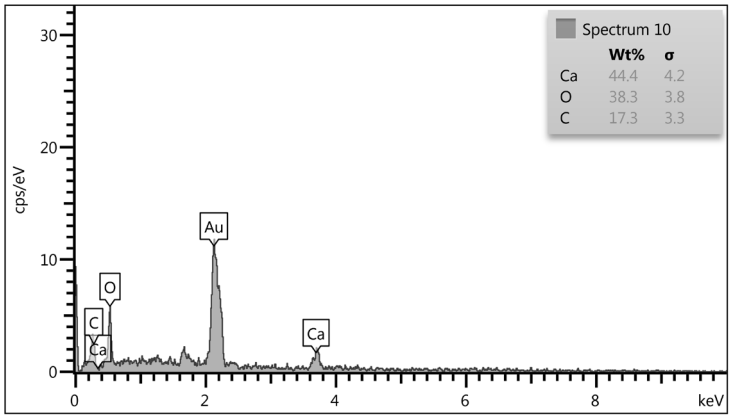


Fig. S 8.11. SEM image with magnifier 5µm for green lithoclast mentioned in Fig. S 8.5. EDS analysis for spectrum 10 suggested carbonate mixed with organic matter.

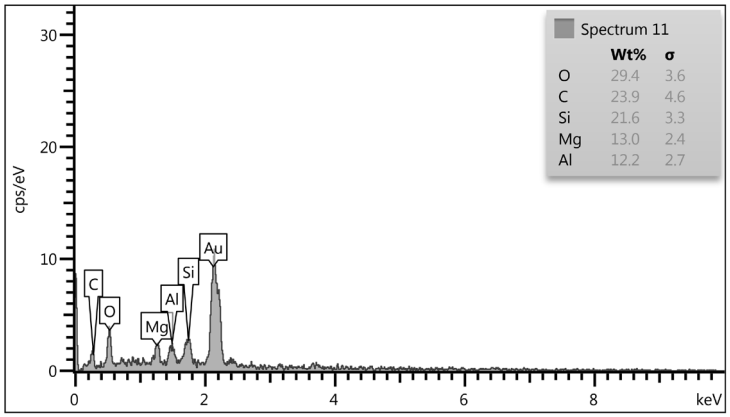


Fig. S 8.12. SEM image with magnifier 5µm for green lithoclast mentioned in Fig. S 8.5. EDS analysis for spectrum 11 suggested montmorillonite minerla

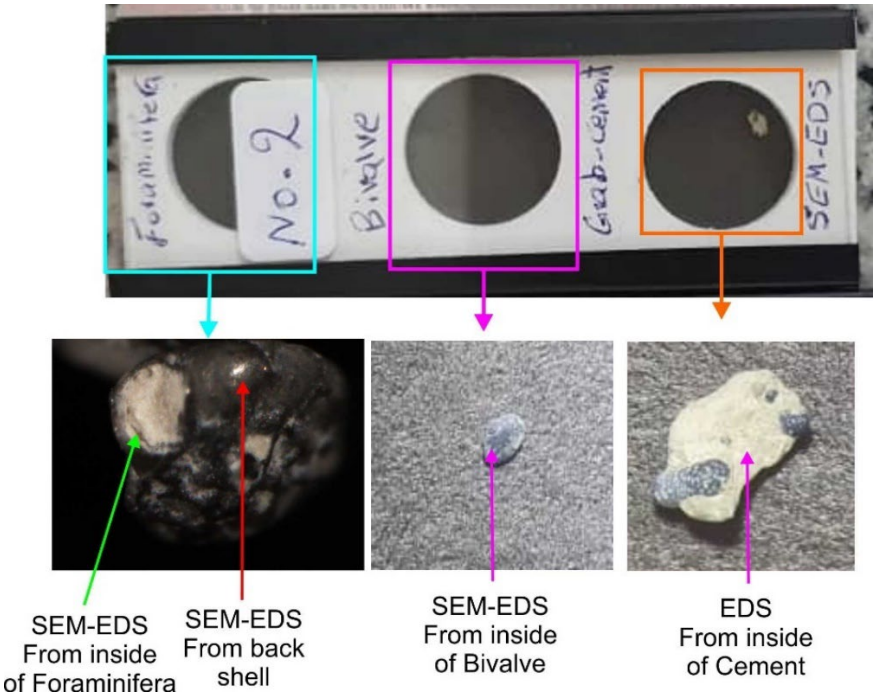
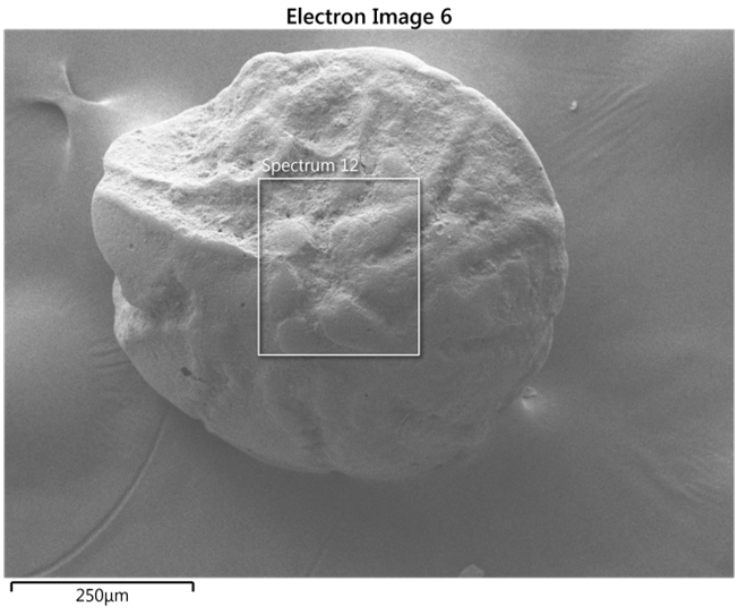


Fig. S 8.13. Binocular microscopy image of foraminifera shell from the core st99 horizon at 101-103 cm. Bivalve shells and marine cement selected from grab sediment samples that obtained from station G.



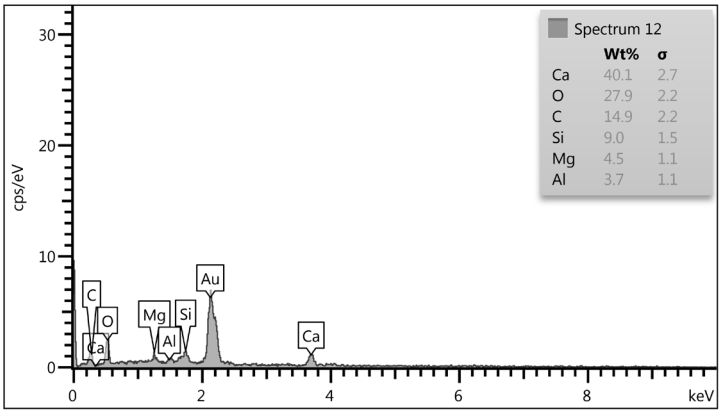


Fig. S 8.14. SEM-EDS analysis from foraminifera shell suggested high-magnesium calcite with kaolinite clay mineral

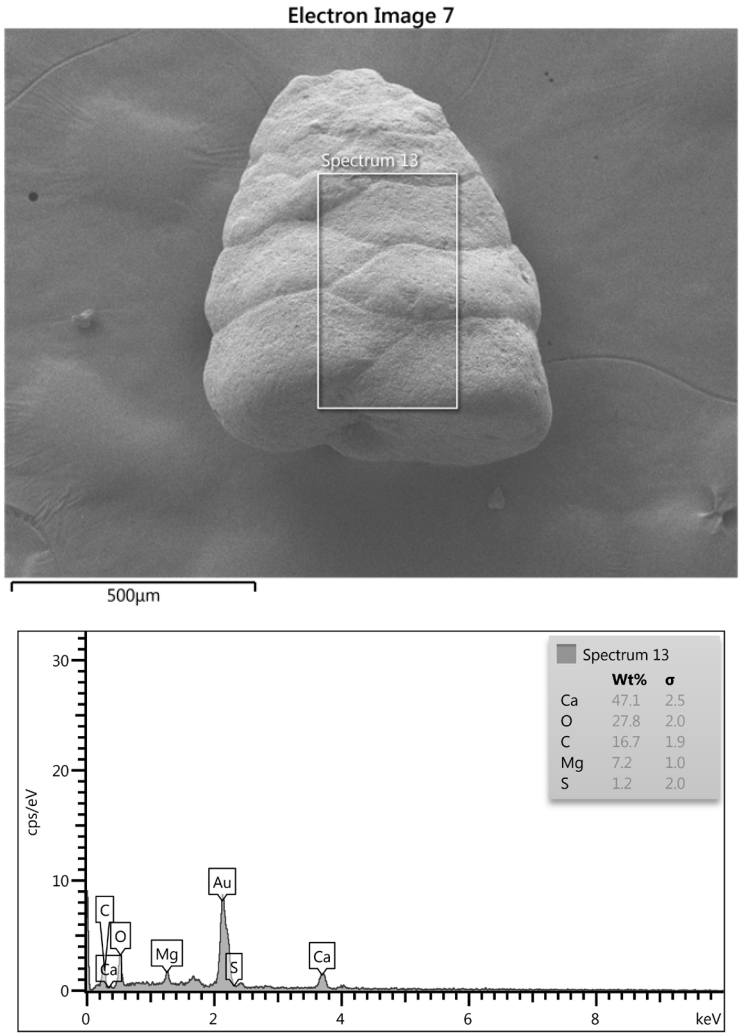


Fig. S 8.15. SEM-EDS analysis from foraminifera shell suggested high-magnesium calcite with organic matter.

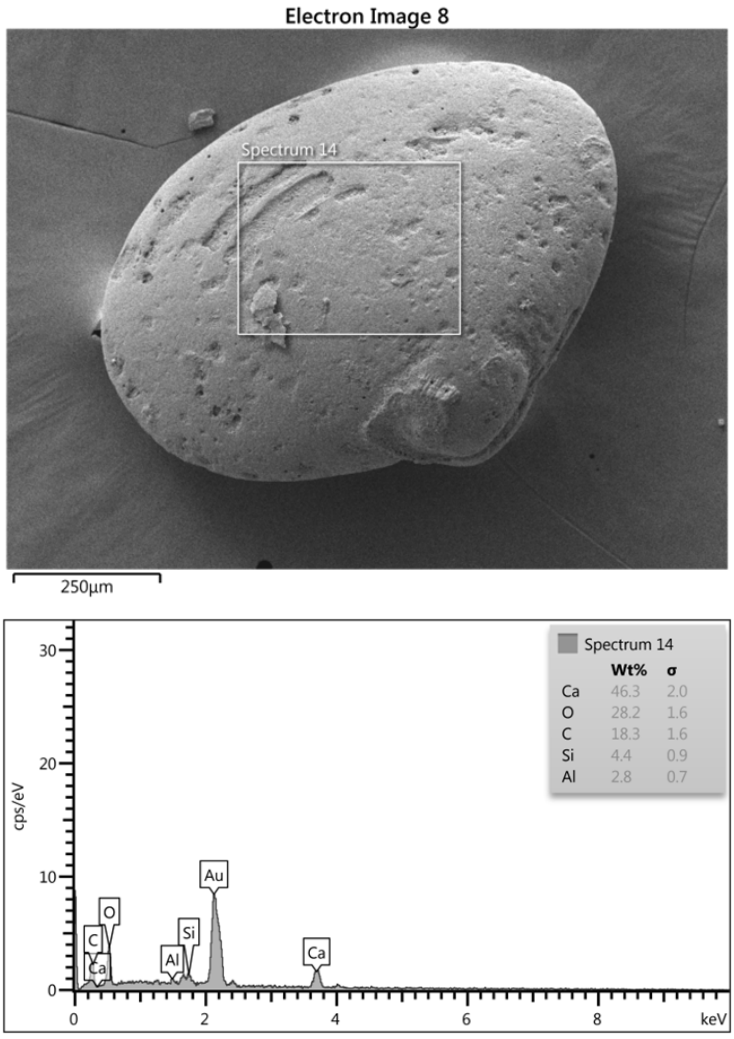
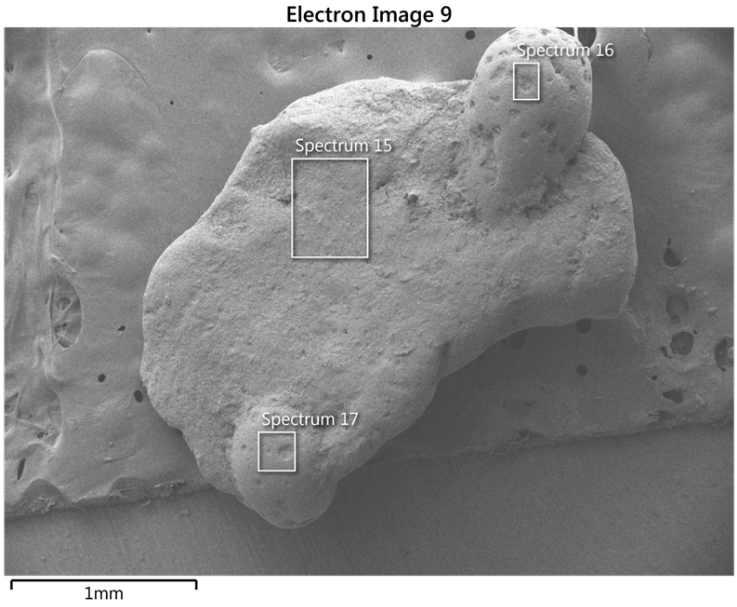


Fig. S 8.16. SEM-EDS analysis from lithoclast suggested high-magnesium calcite with kaolinite clay mineral



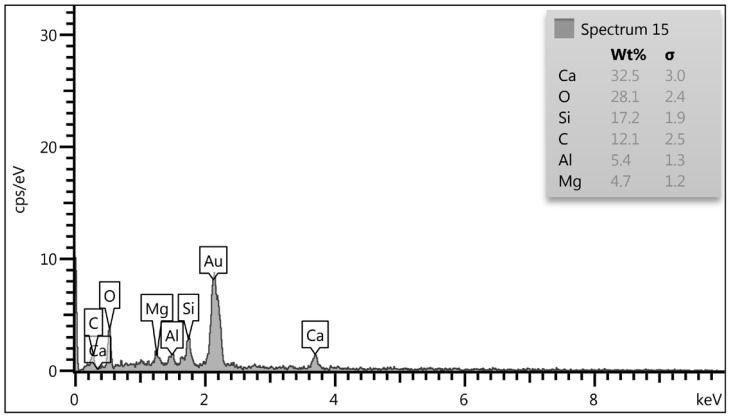


Fig. S 8.17. SEM image with magnifier 1mm for lithoclast mentioned in Fig. S 8.12. EDS analysis for spectrum 15 suggested high-magnesium calcite cement with kaolinite and matter

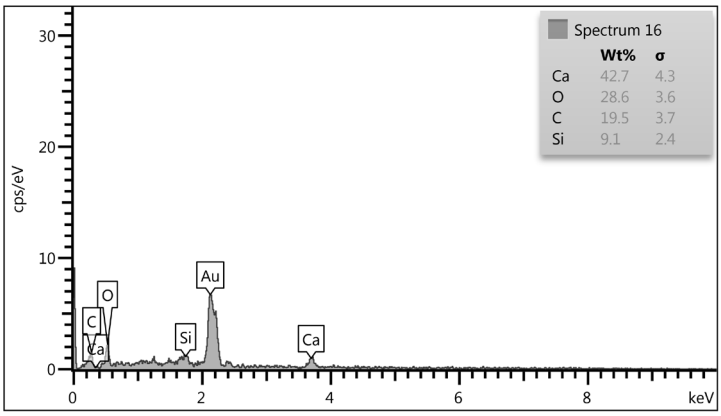


Fig. S 8.18. SEM image with magnifier 1mm for lithoclast mentioned in Fig. S 8.12. EDS analysis for spectrum 16 suggested low-magnesium calcite with silica

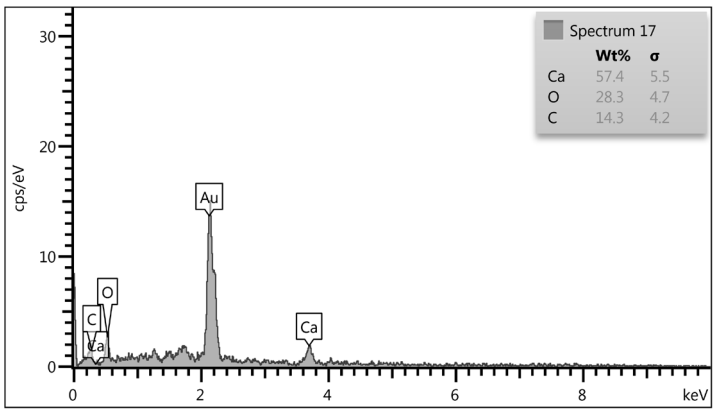


Fig. S 8.19. SEM image with magnifier 1mm for lithoclast mentioned in Fig. S 8.12. EDS analysis for spectrum 17 suggested carbonate mixed with organic matter

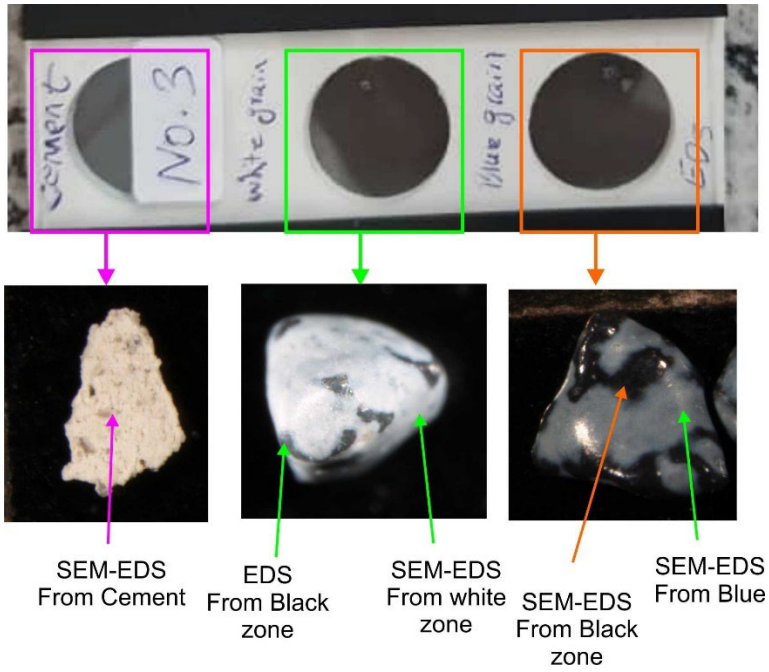


Fig. S 8.20. Binocular microscopy image of marine cement, white lithoclast and two litoclasts with mixed blue and black color from the core st99 horizon at 101-103 cm.

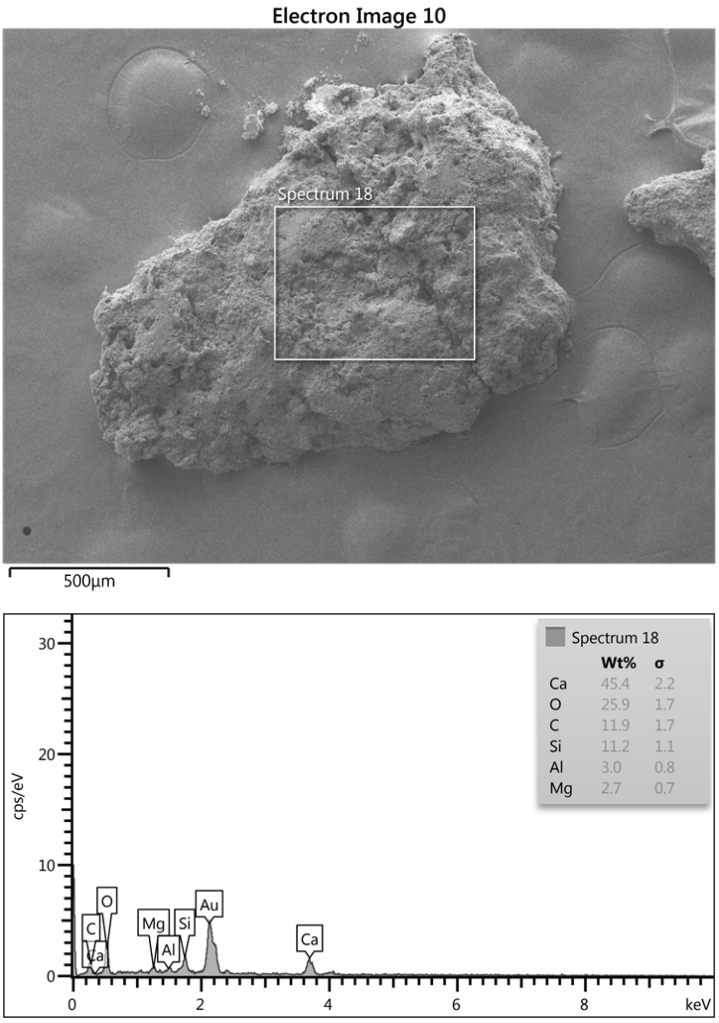


Fig. S 8.21. SEM image with magnifier 500µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 18 suggested low magnesium calcite cement, kaolinite and organic matter

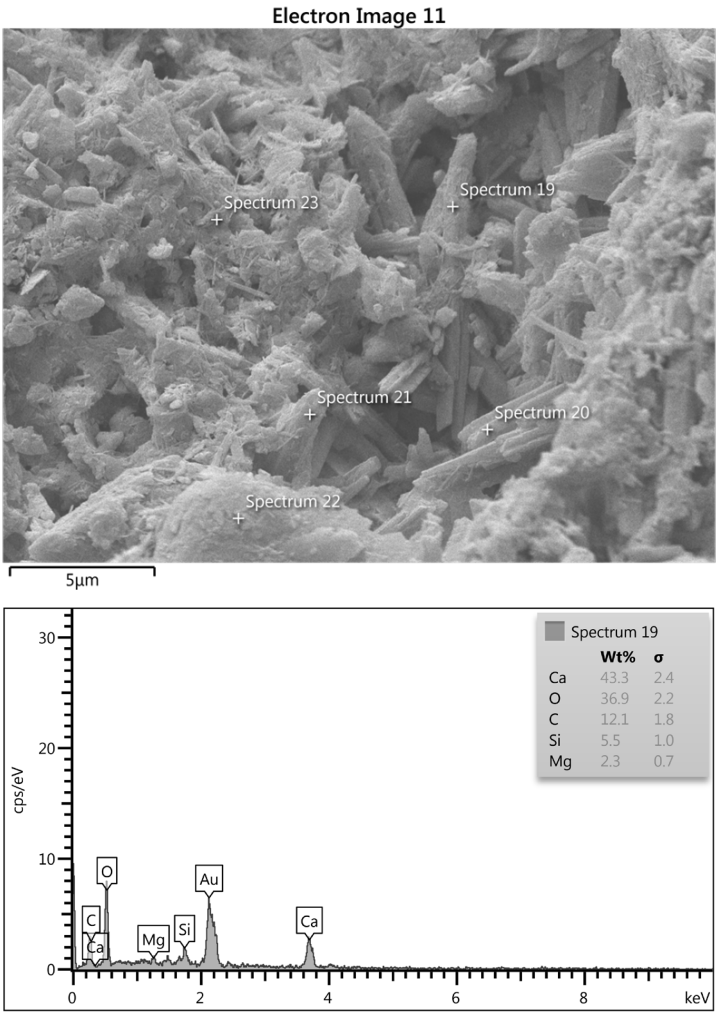


Fig. S 8.22. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 19 suggested low magnesium calcite cement with slica

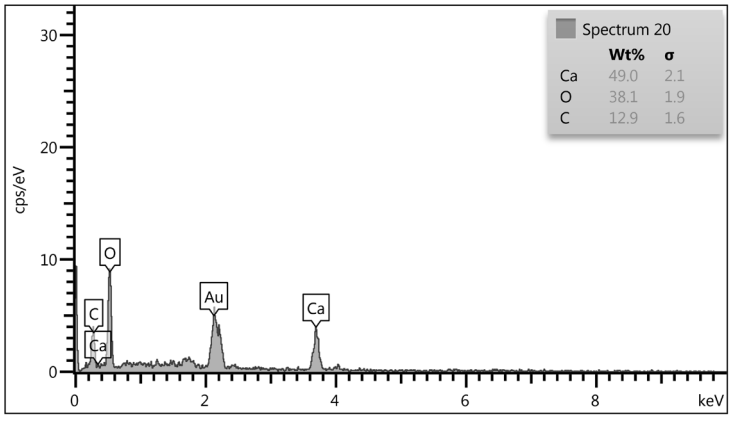


Fig. S 8.23. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 20 suggested carbonate and organic matter

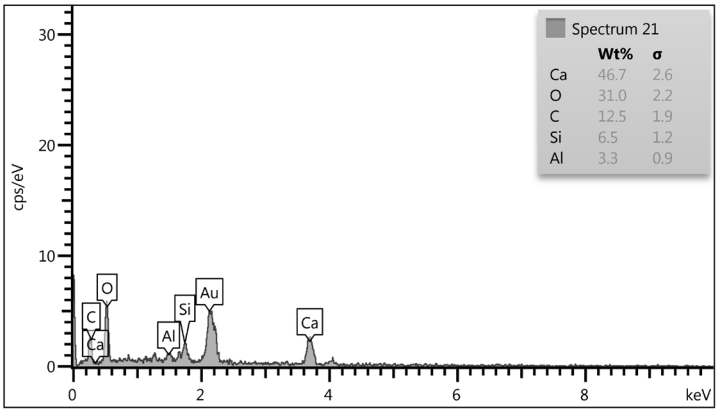


Fig. S 8.24. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 21 suggested low magnesium calcite cement, kaolinite and organic matter

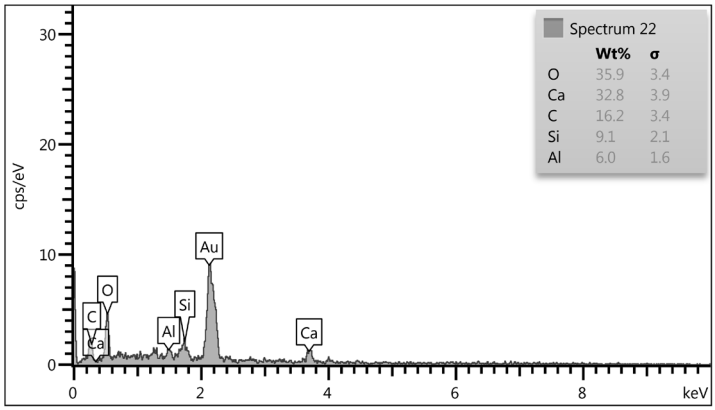


Fig. S 8.25. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 22 suggested low magnesium calcite cement, kaolinite and organic matter

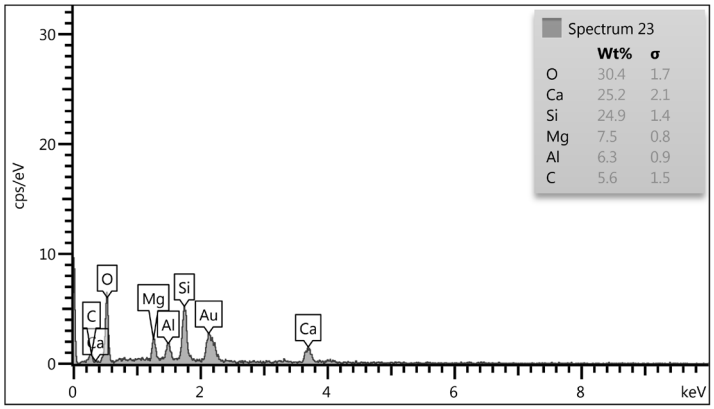


Fig. S 8.26. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 23 suggested high-magnesium calcite cement, kaolinite and organic matter

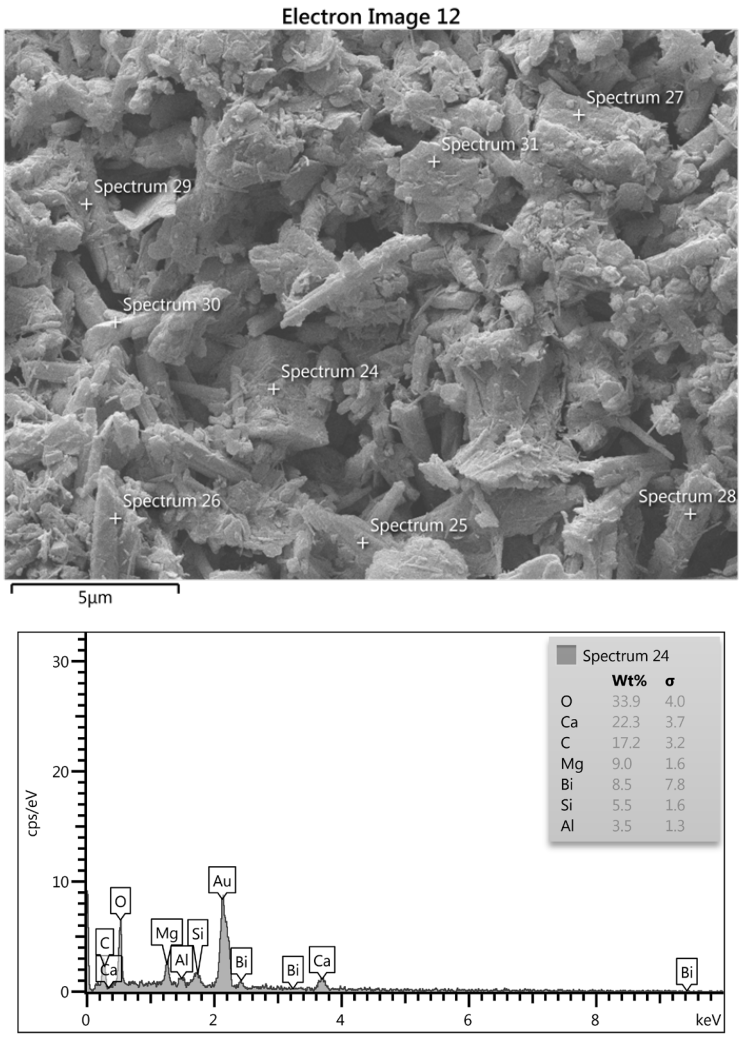


Fig. S 8.27. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 24 suggested high-magnesium calcite cement, Bismuth sulfide, kaolinite and organic matter

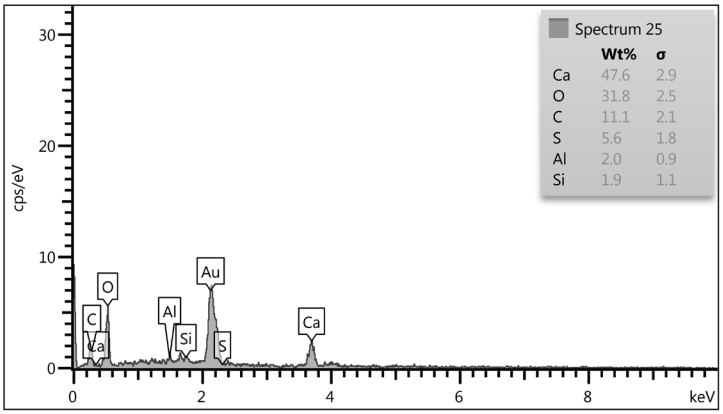


Fig. S 8.28. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 25 suggested low-magnesium calcite cement, kaolinite and organic matter

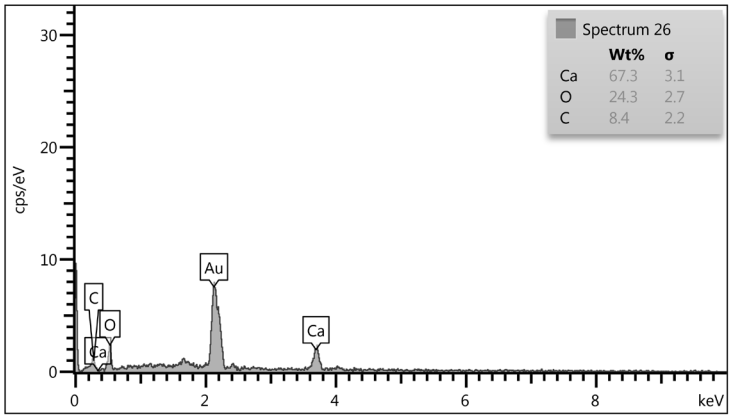


Fig. S 8.29. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 26 suggested low-magnesium calcite cement

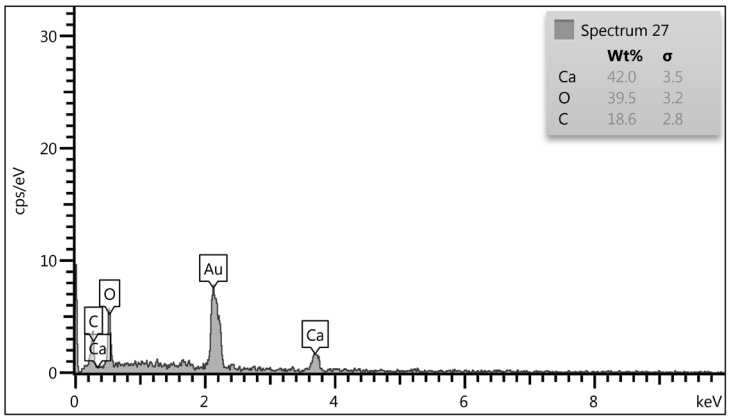


Fig. S 8.30. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 27 suggested low-magnesium calcite cement

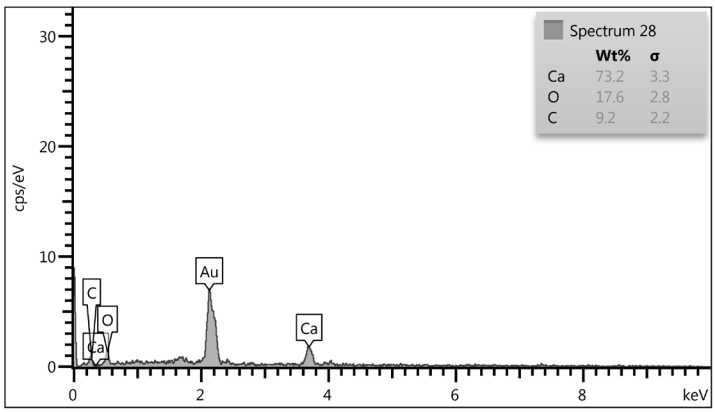


Fig. S 8.31. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 28 suggested low-magnesium calcite cement

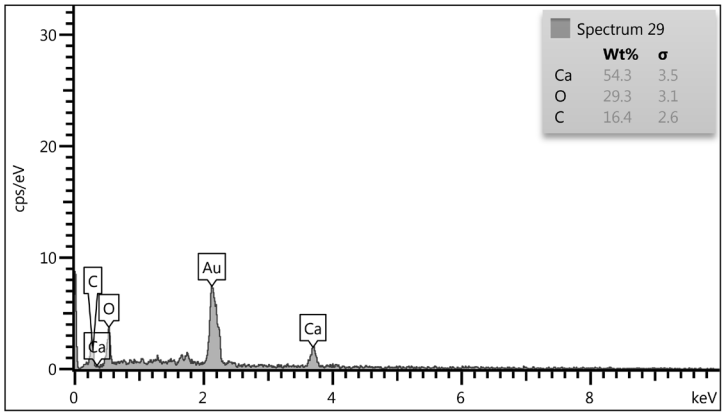


Fig. S 8.32. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 29 suggested low-magnesium calcite cement mixed with organic matter

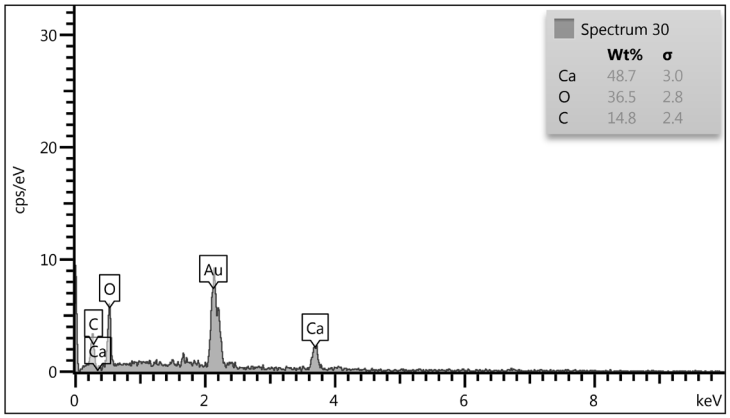


Fig. S 8.33. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 30 suggested low-magnesium calcite cement mixed with organic matter

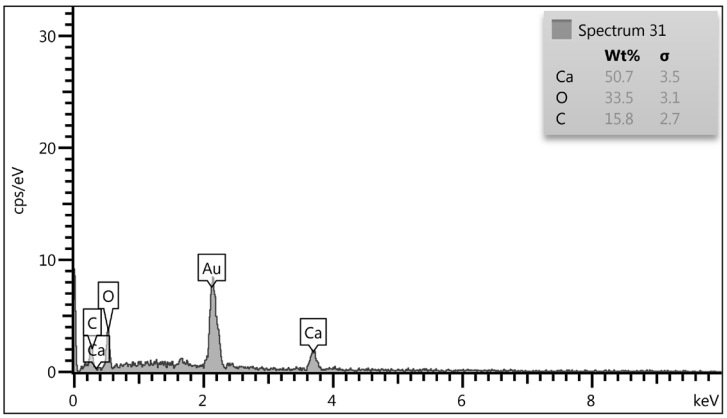


Fig. S 8.34. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 31 suggested low-magnesium calcite cement mixed with organic matter

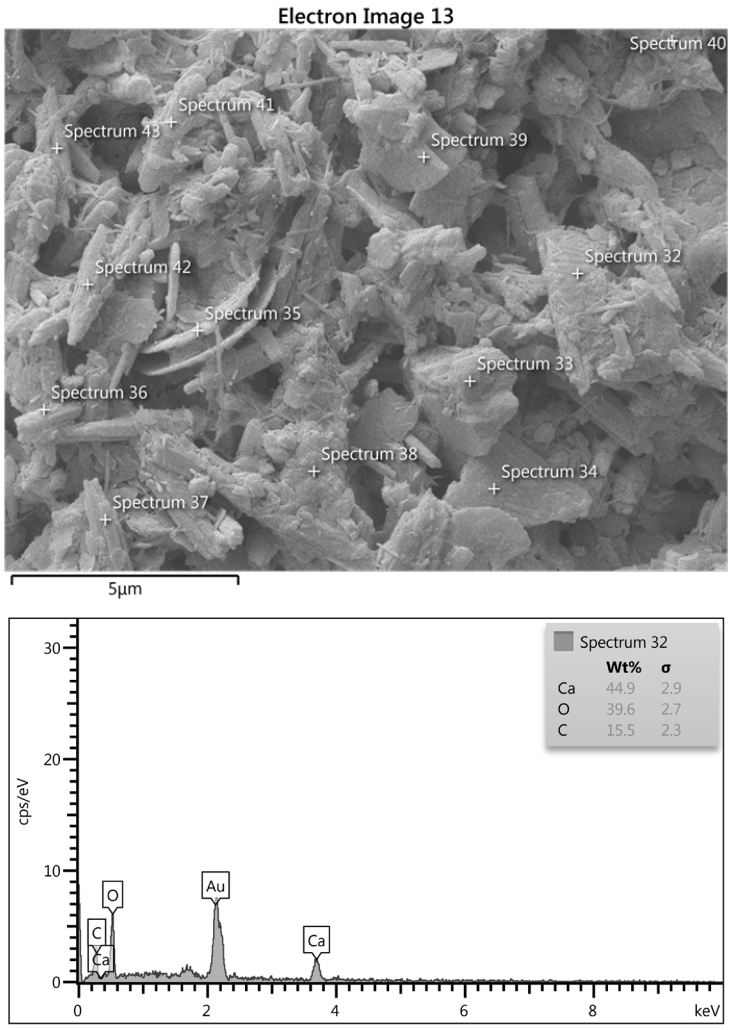


Fig. S 8.35. SEM image with magnifier 5µm for cement mentioned in Fig. Fig. S 8.19. EDS analysis for spectrum 32 suggested low-magnesium calcite cement mixed with organic matter

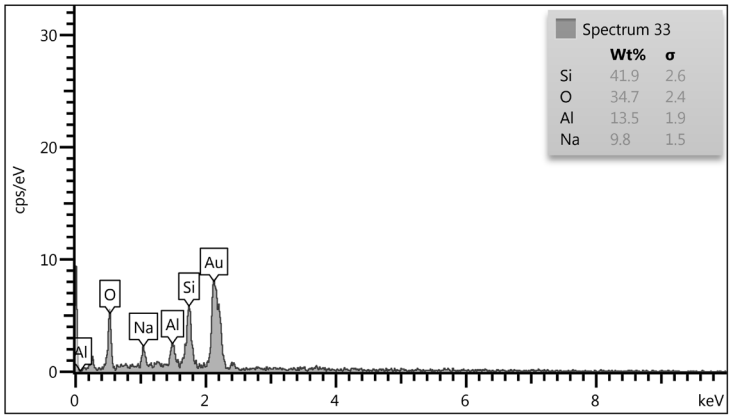


Fig. S 8.36. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 33 suggested Analcime mineral

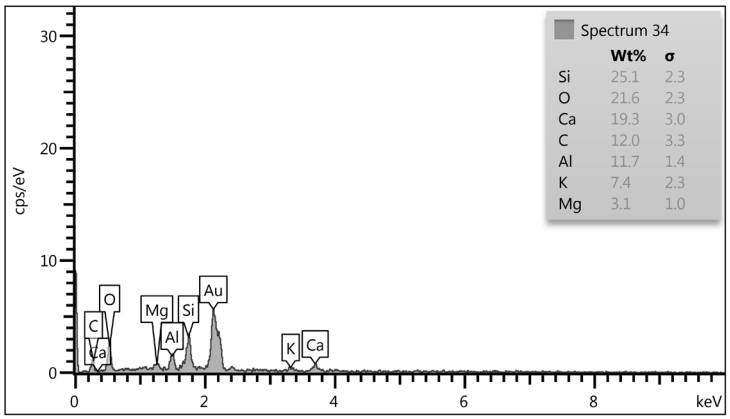


Fig. S 8.37. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 34 suggested phlogoite mineral

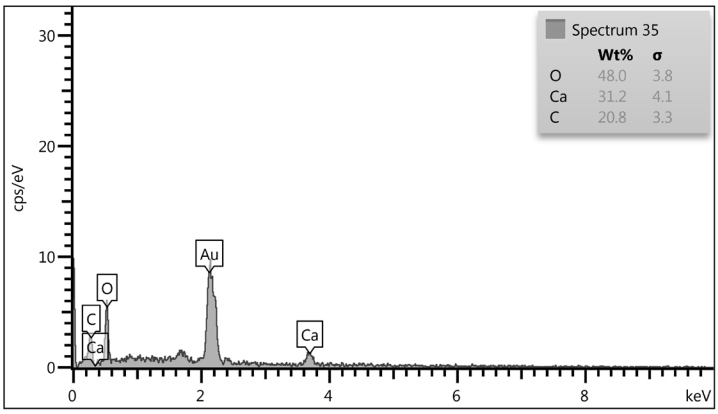


Fig. S 8.38. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 35 suggested low-magnesium calcite cement mixed with organic matter

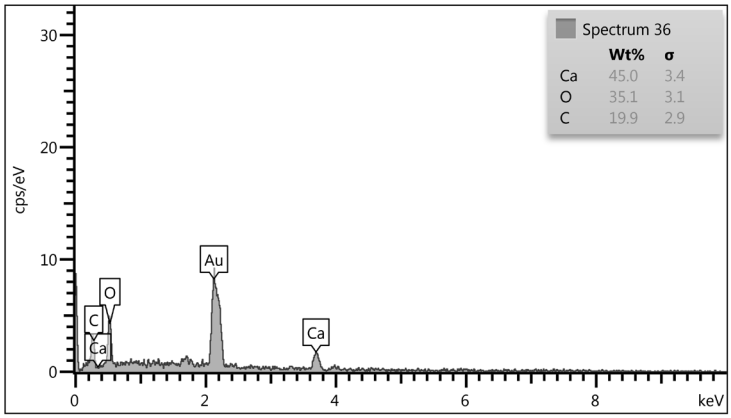


Fig. S 8.39. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 36 suggested low-magnesium calcite cement mixed with organic matter

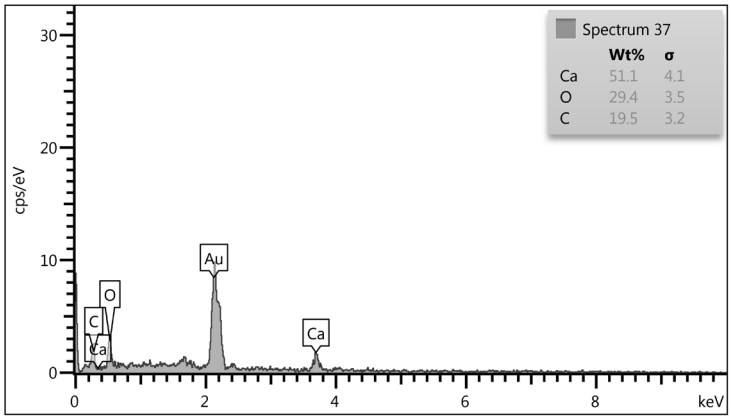


Fig. S 8.40. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 37 suggested low-magnesium calcite cement mixed with organic matter

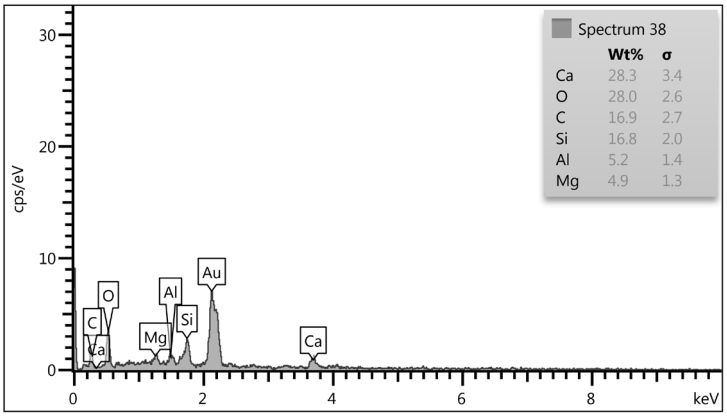


Fig. S 8.41. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 38 suggested low-magnesium calcite cement mixed with organic matter

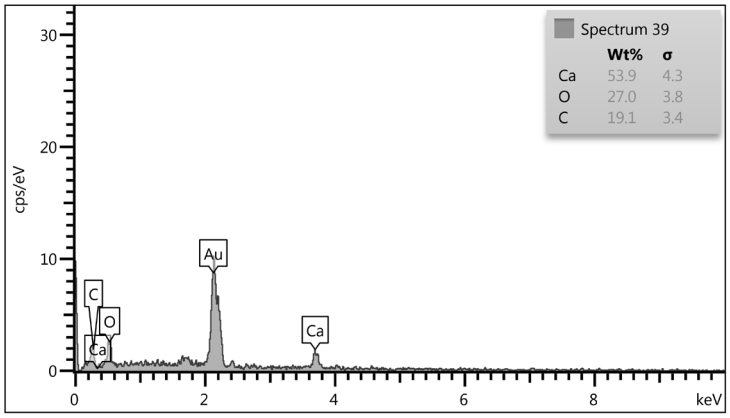


Fig. S 8.42. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 39 suggested low-magnesium calcite cement mixed with organic matter

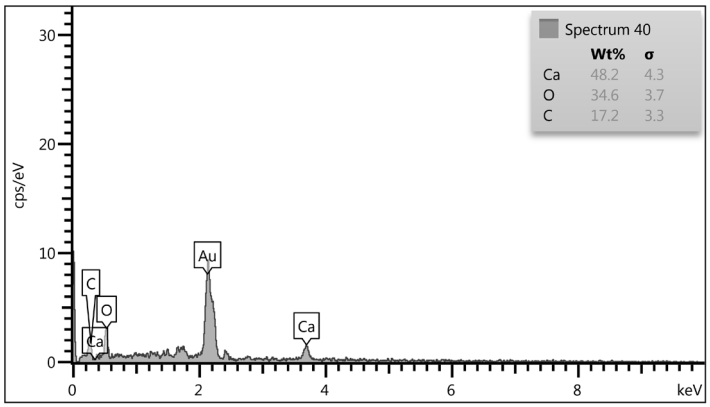


Fig. S 8.43. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 40 suggested low-magnesium calcite cement mixed with organic matter

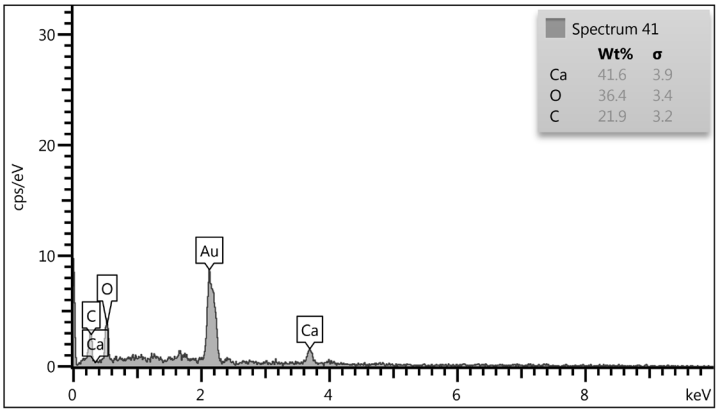


Fig. S 8.44. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 41 suggested low-magnesium calcite cement mixed with organic matter

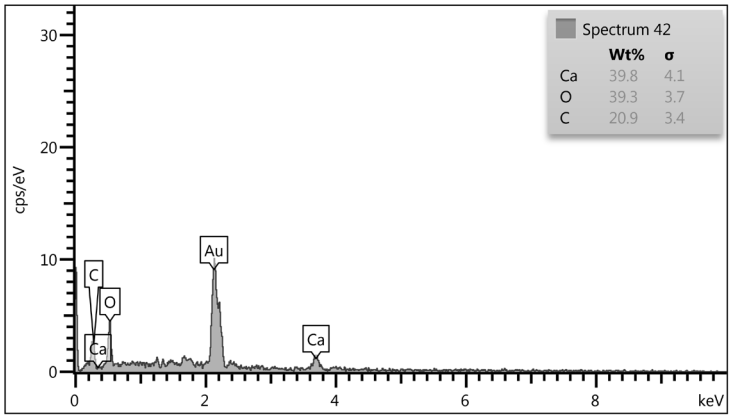


Fig. S 8.45. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 42 suggested low-magnesium calcite cement mixed with organic matter

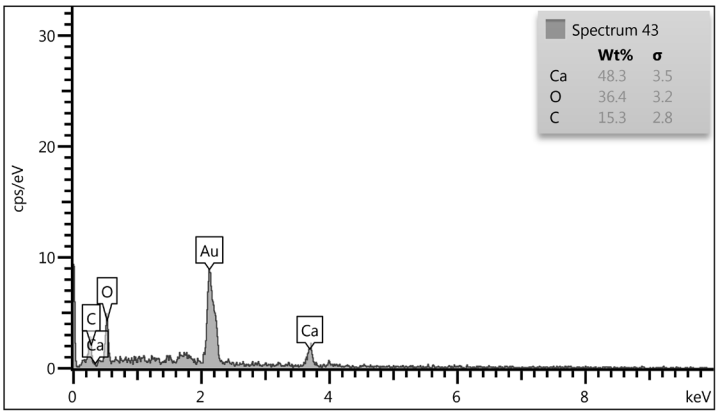


Fig. S 8.46. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 43 suggested low-magnesium calcite cement mixed with organic matter

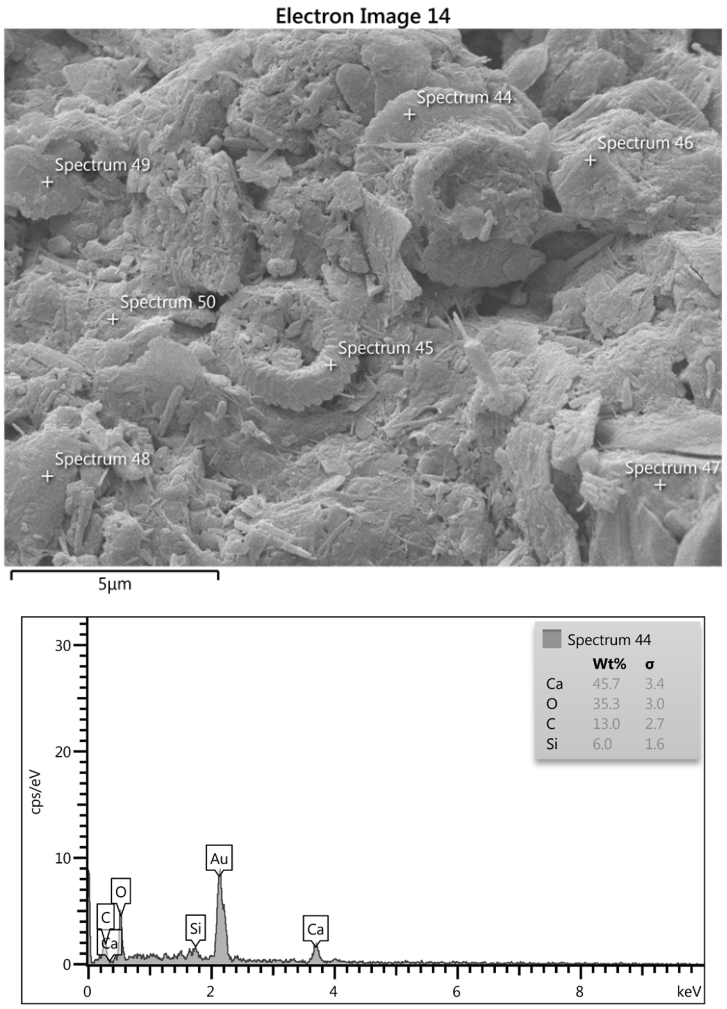


Fig. S 8.47. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 44 suggested low-magnesium calcite cement mixed with organic matter and slica

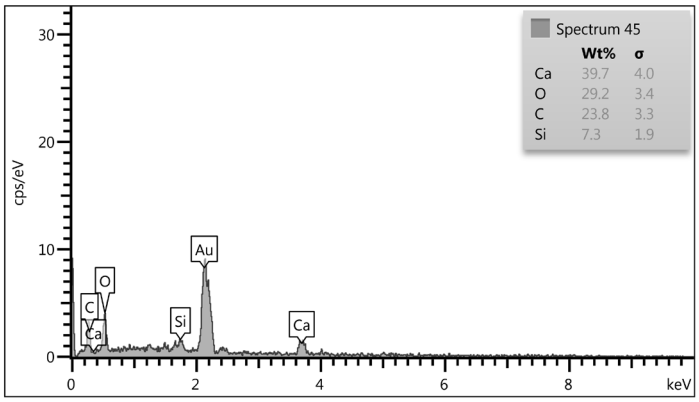


Fig. S 8.48. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 45 suggested low-magnesium calcite cement mixed with organic matter and slica

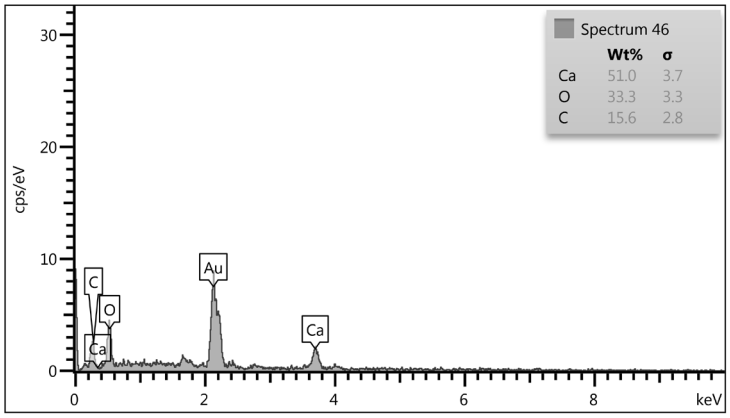


Fig. S 8.49. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 46 suggested low-magnesium calcite cement mixed with organic matter

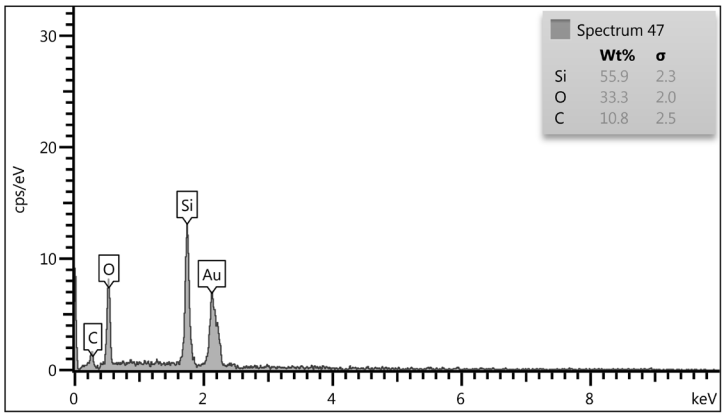


Fig. S 8.50. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 47 suggested quartz

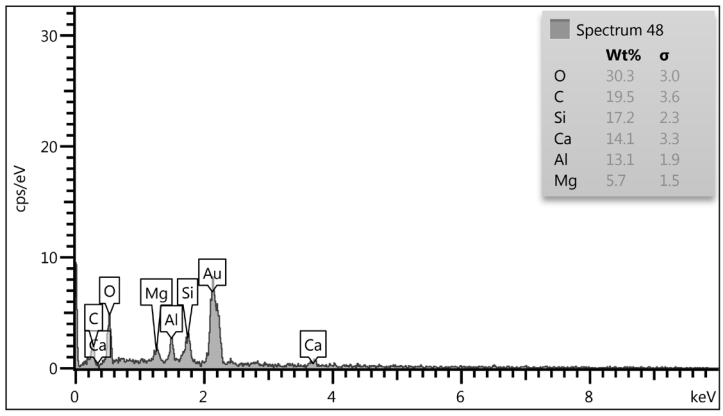


Fig. S 8.51. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 48 suggested Xanthophyll

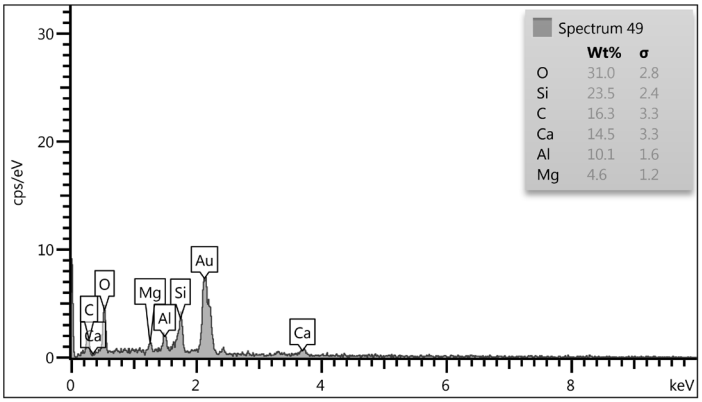


Fig. S 8.52. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 49 suggested Xanthophyll

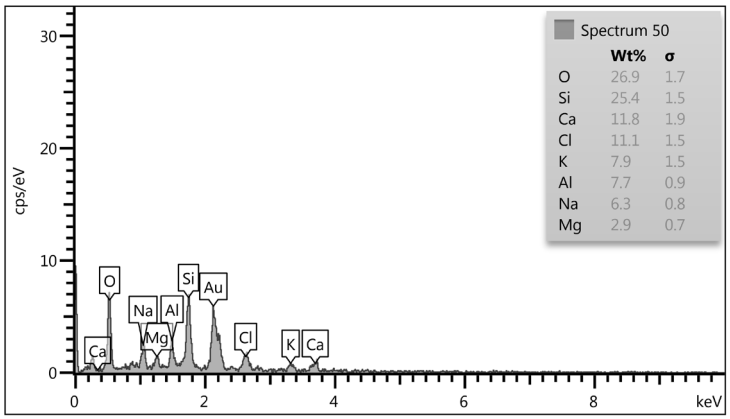


Fig. S 8.53. SEM image with magnifier 5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 50 suggested Scapolite mineral

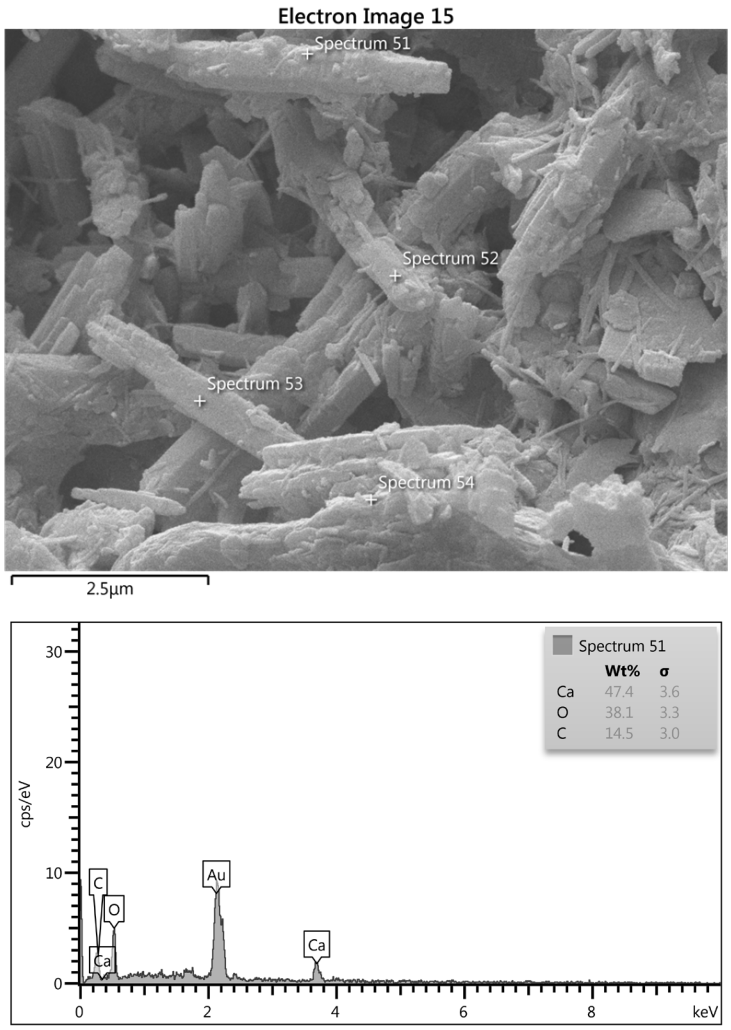


Fig. S 8.54. SEM image with magnifier 2.5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 51 suggested low-magnesium calcite cement mixed with organic matter

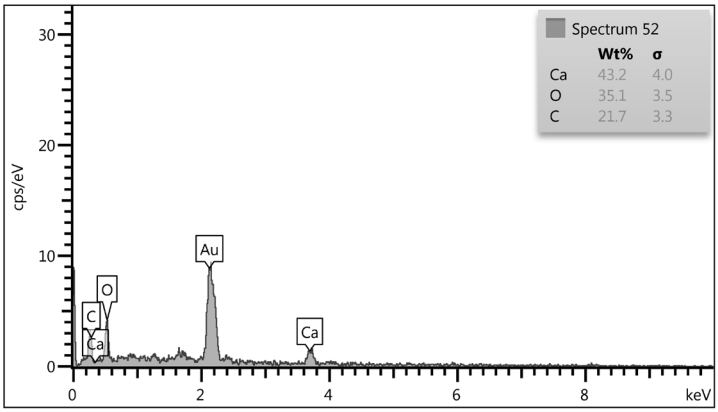


Fig. S 8.55. SEM image with magnifier 2.5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 52 suggested low-magnesium calcite cement mixed with organic matter

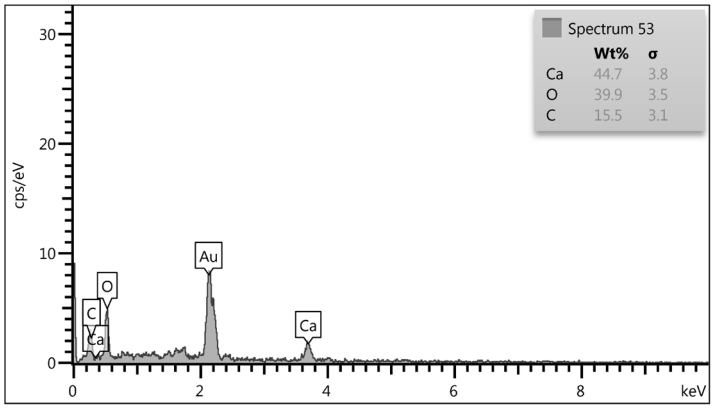


Fig. S 8.56. SEM image with magnifier 2.5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 53 suggested low-magnesium calcite cement mixed with organic matter

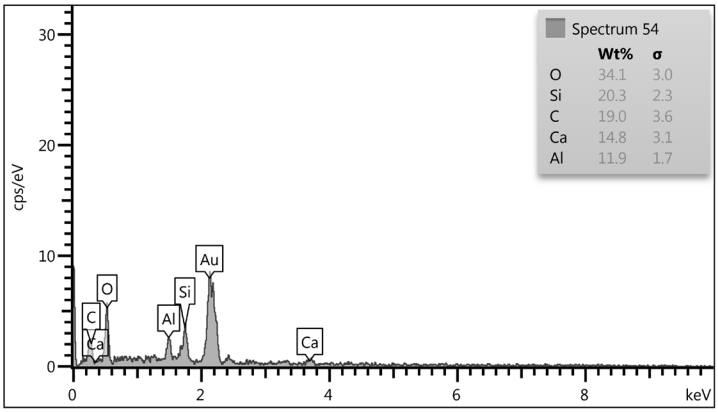


Fig. S 8.57. SEM image with magnifier 2.5µm for cement mentioned in Fig. S 8.19. EDS analysis for spectrum 54 suggested low-magnesium calcite cement mixed with organic matter and kaolinite

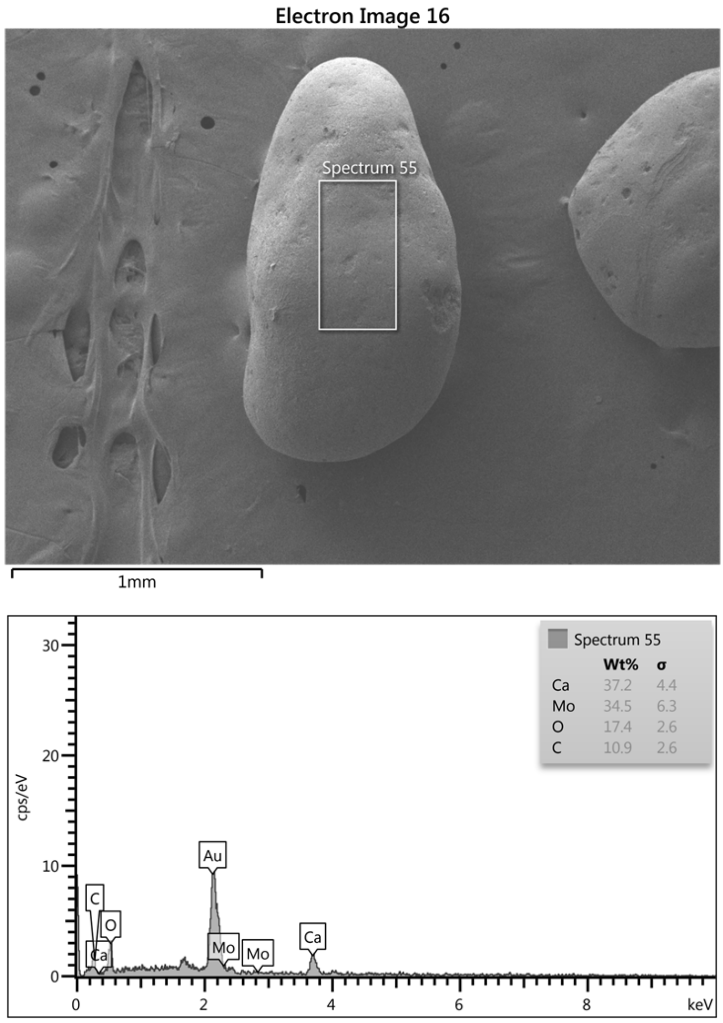


Fig. S 8.58. SEM image with magnifier 1mm for blue lithoclast mentioned in Fig. S 8.19. EDS analysis for spectrum 55 suggested Powellite mineral

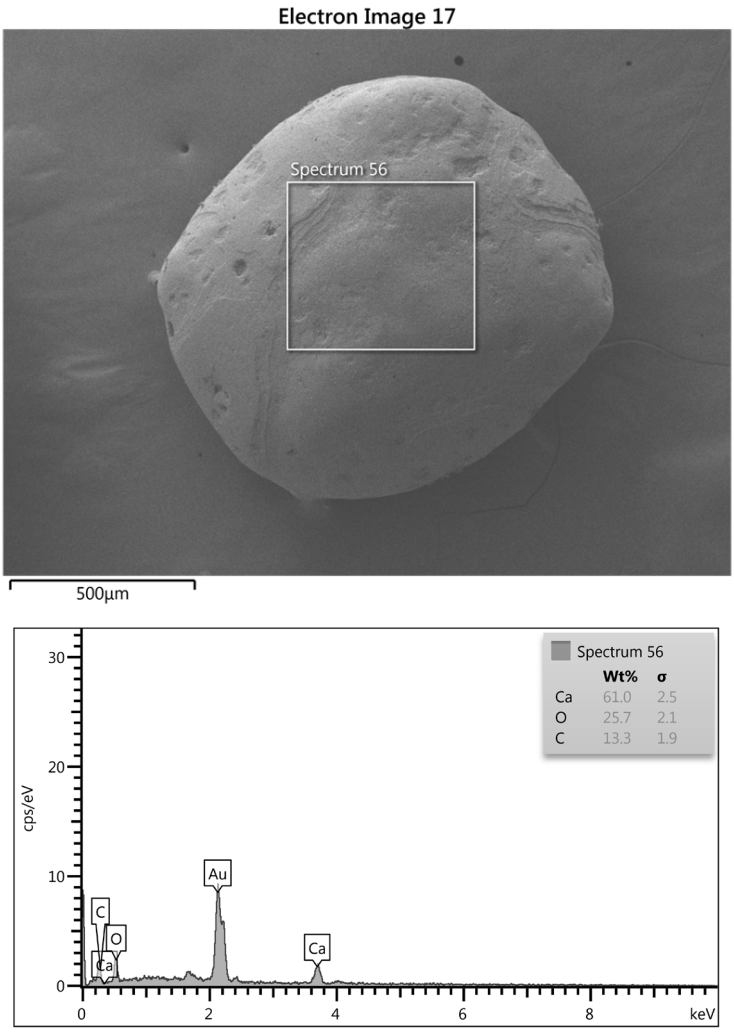


Fig. S 8.59. SEM image with magnifier 500µm for white lithoclast mentioned in Fig. S 8.19. EDS analysis for spectrum 56 suggested calcite and organic matter

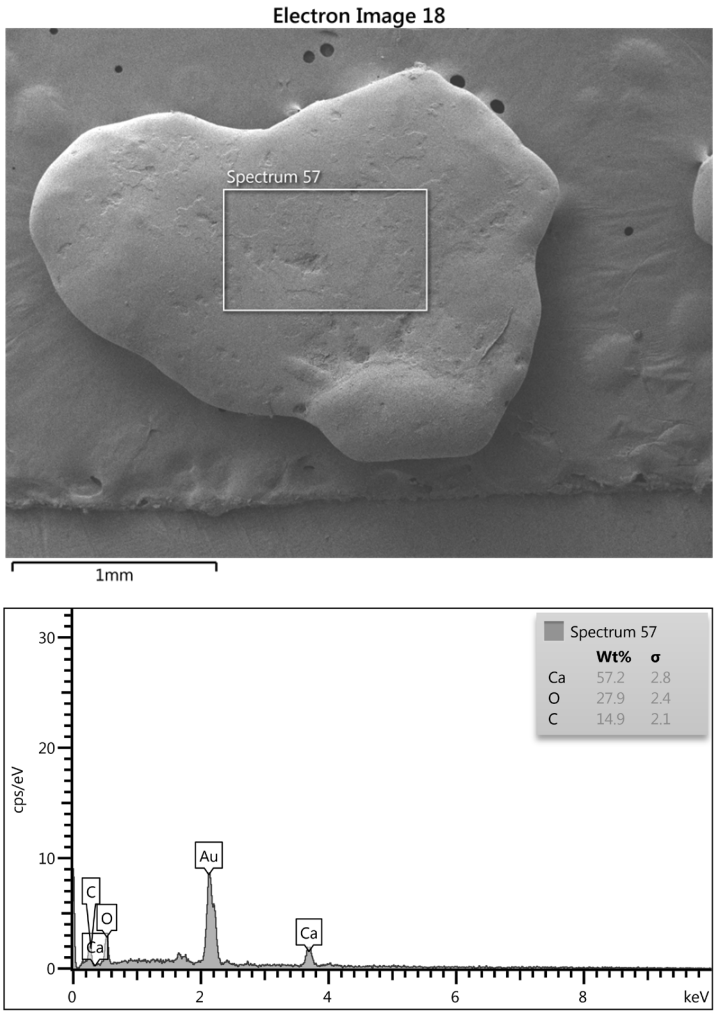


Fig. S 8.60. SEM image with magnifier 1mm for white lithoclast mentioned in Fig. S 8.19. EDS analysis for spectrum 57 suggested calcite and organic matter

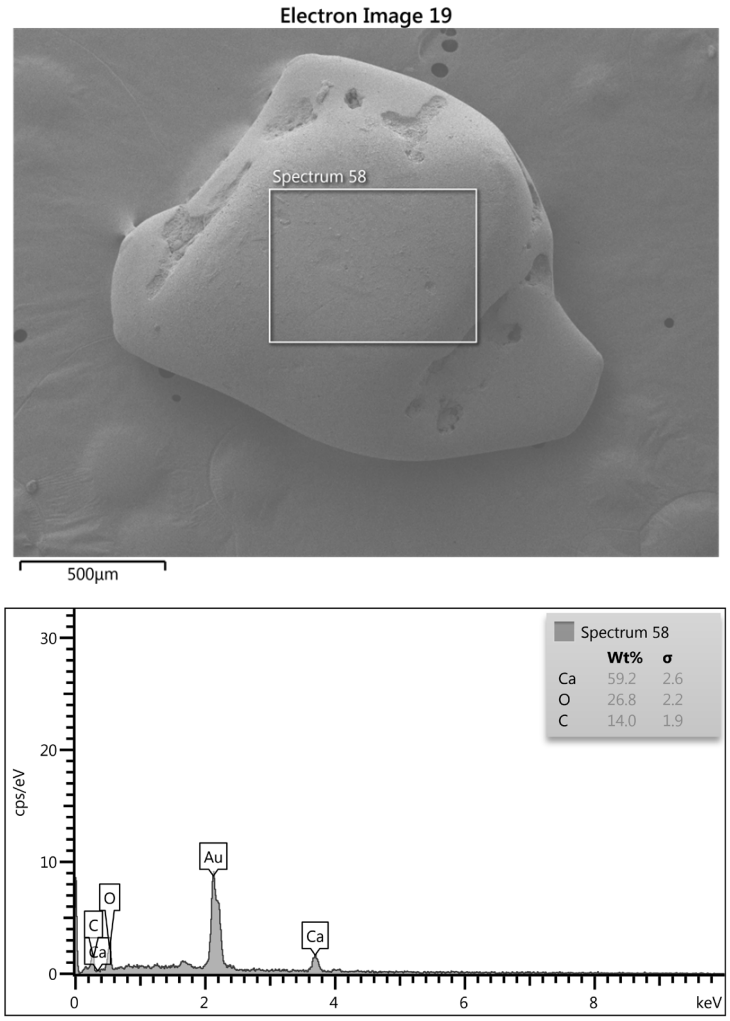


Fig. S 8.61. SEM image with magnifier 500µm for white lithoclast mentioned in Fig. S 8.19. EDS analysis for spectrum 58 suggested calcite and organic matter

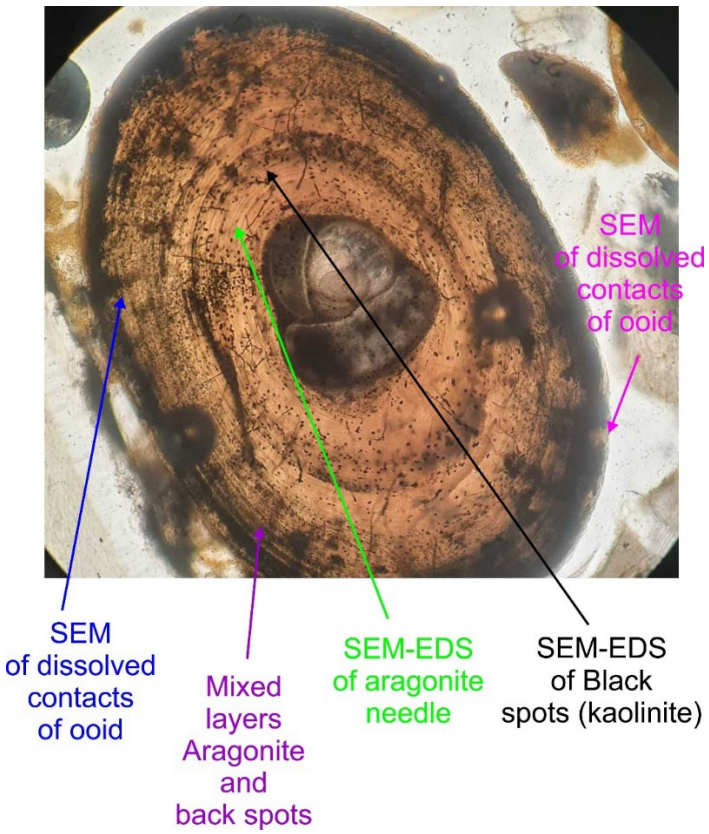


Fig. S 8.62. Thin section photo under cross-polarized light with magnifier 75X for ooid grain. SEM-EDS analysis zones defined with different colours.

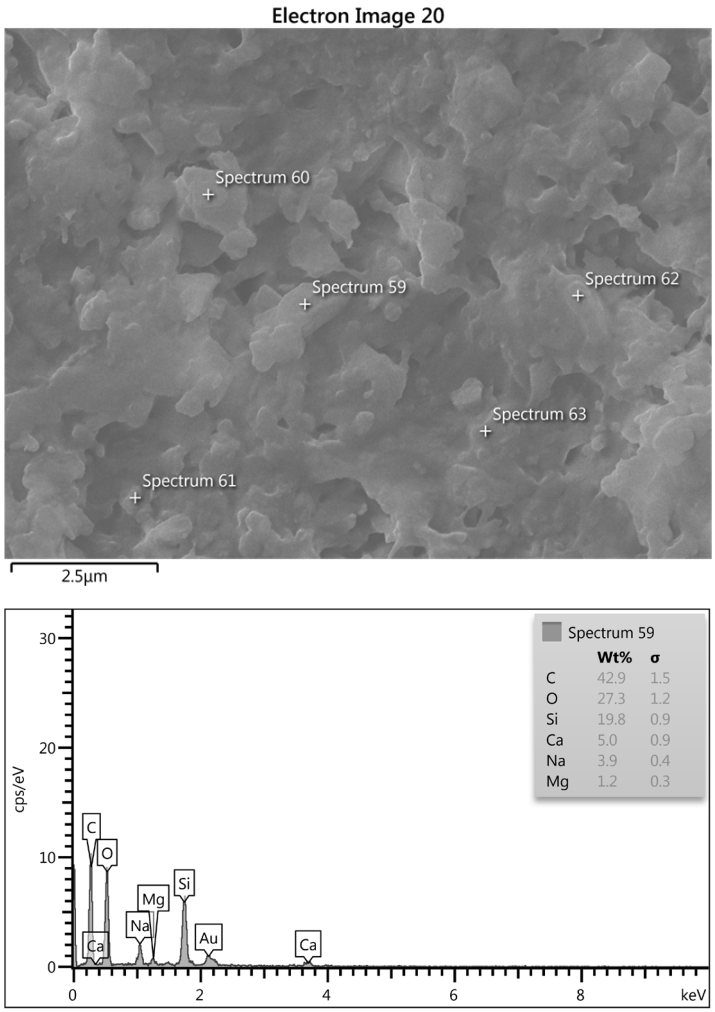


Fig. S 8.63. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 59 suggested low-magnesium calcite with sodium, silica and organic matter.

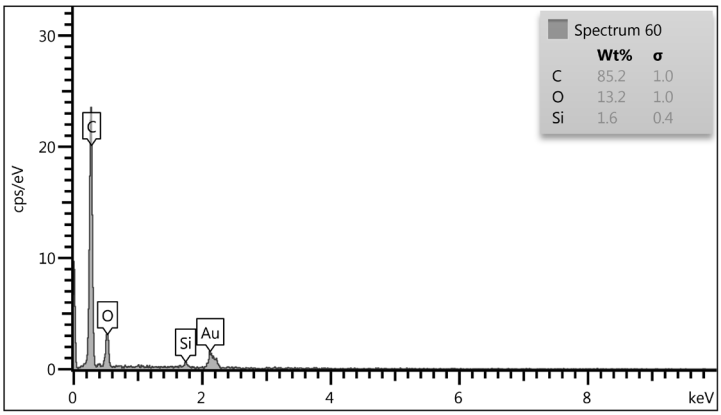


Fig. S 8.64. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 60 suggested quartz mineral coverd with organic matter.

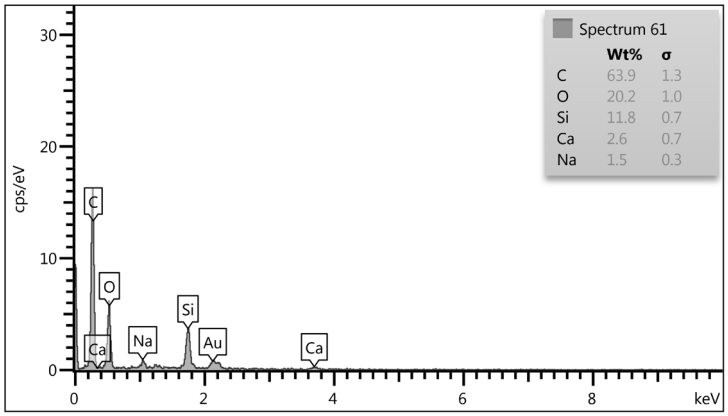


Fig. S 8.65. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 61 suggested quartz mineral coverd with organic matter.

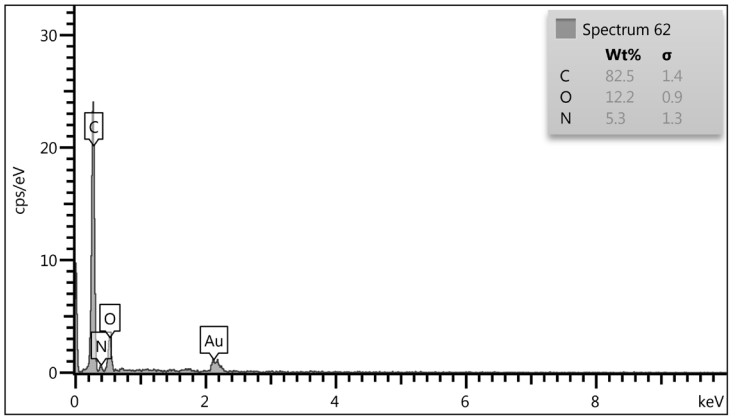


Fig. S 8.66. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 62 suggested high amount of organic matter

شکل 133- آنالیز EDS از ساختار داخلی اید، نشان دهنده ماده آلی و نیتروژن می باشد.

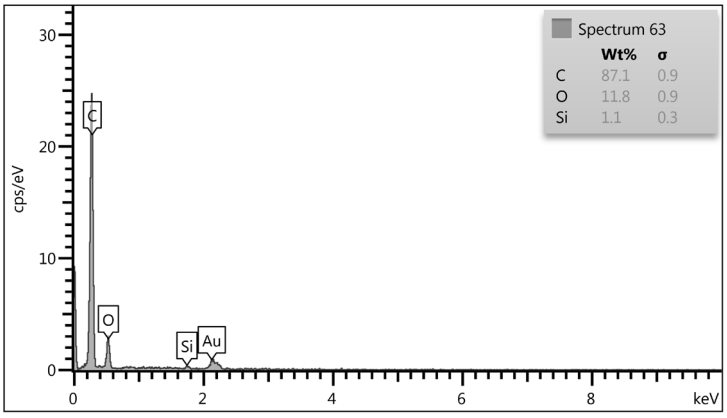


Fig. S 8.67. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 63 suggested high amount of organic matter

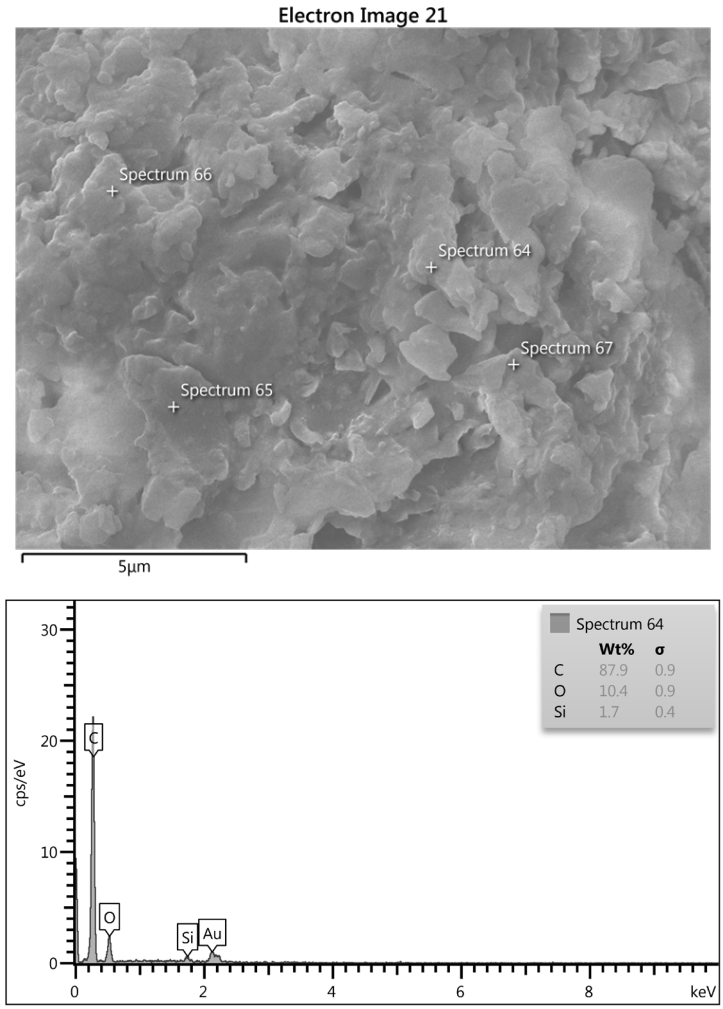


Fig. S 8.68. SEM image with magnifier 5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 64 suggested high amount of organic matter

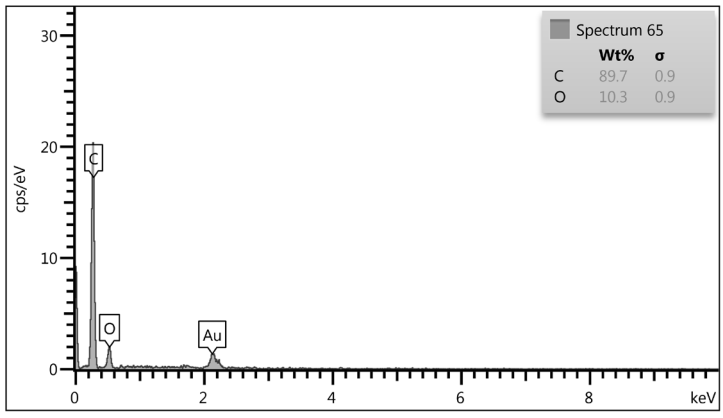


Fig. S 8.69. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 65 suggested high amount of organic matter

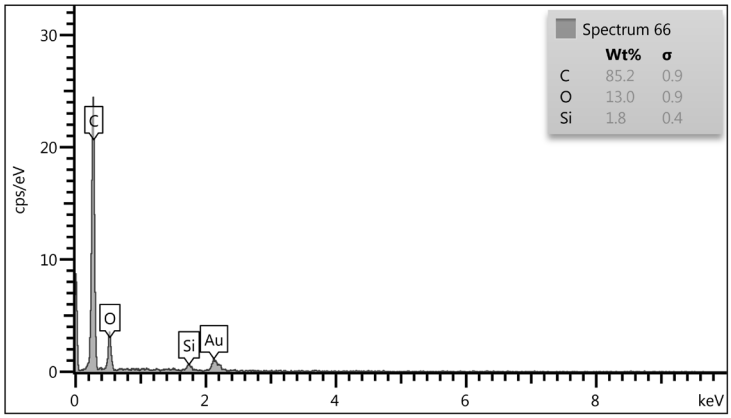


Fig. S 8.70. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 66 suggested high amount of organic matter

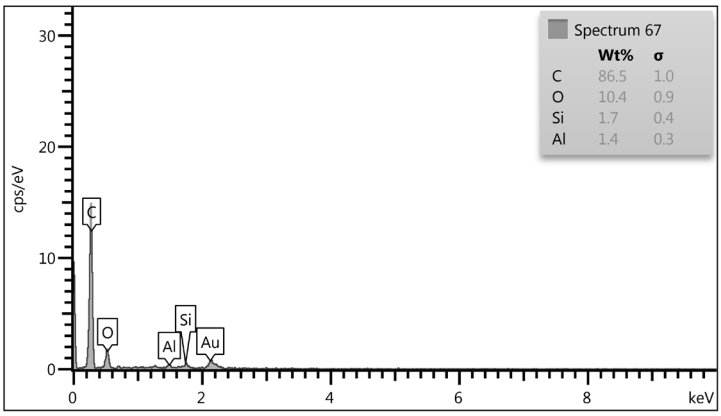


Fig. S 8.71. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 67 suggested high amount of organic matter with small amount of kaolinite and quartz

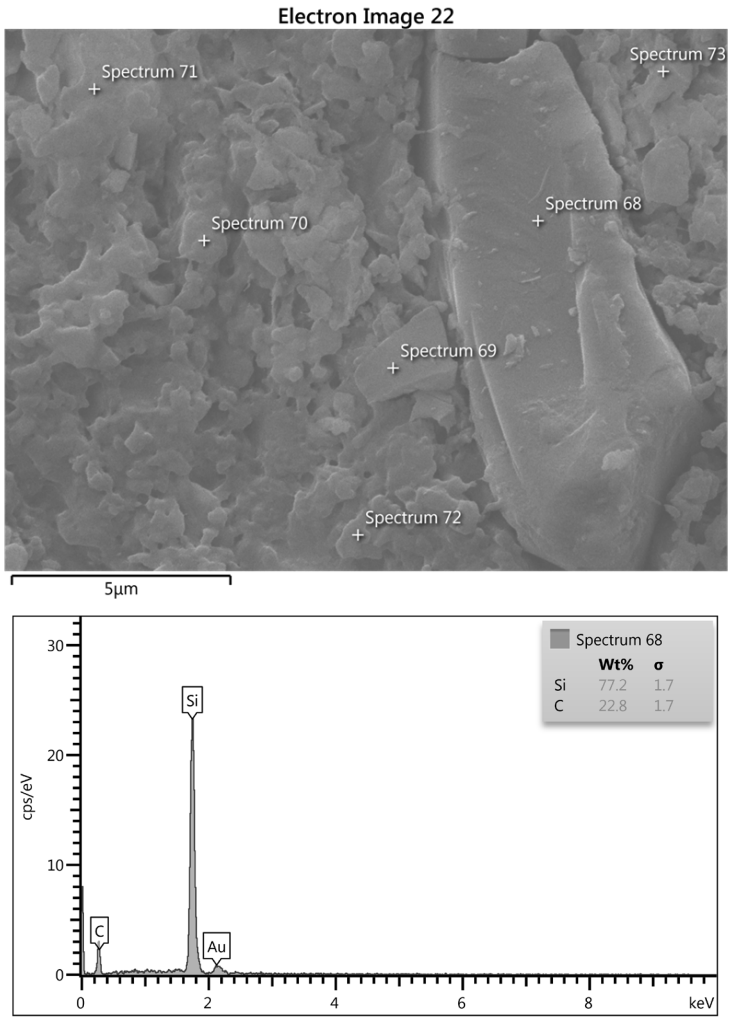


Fig. S 8.72. SEM image with magnifier 5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 68 suggested Moissanite mineral

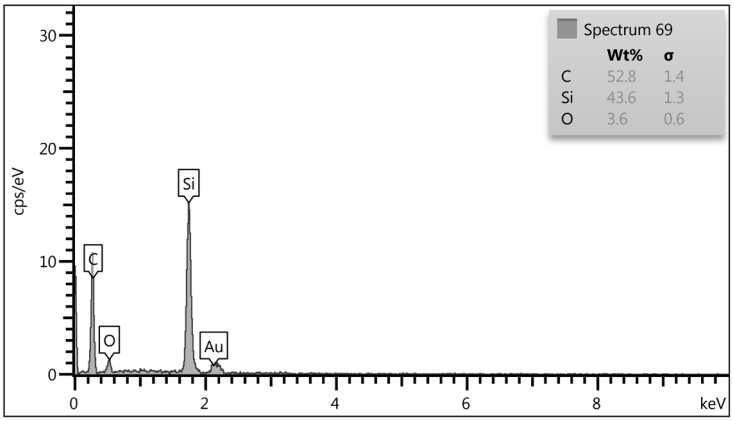


Fig. S 8.73. SEM image with magnifier 5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 69 suggested Moissanite mineral

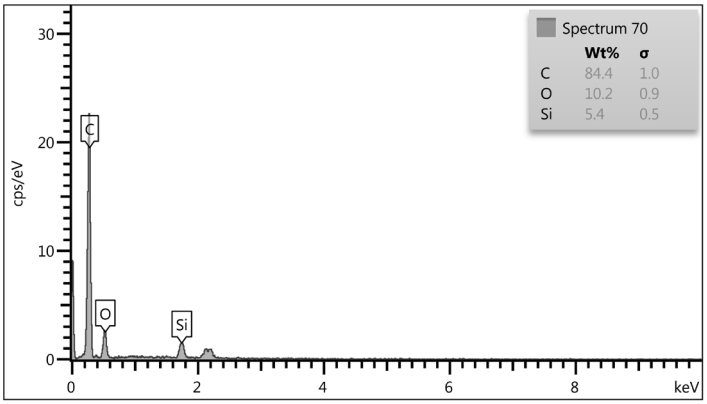


Fig. S 8.74. SEM image with magnifier 2.5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 70 suggested high amount of organic matter

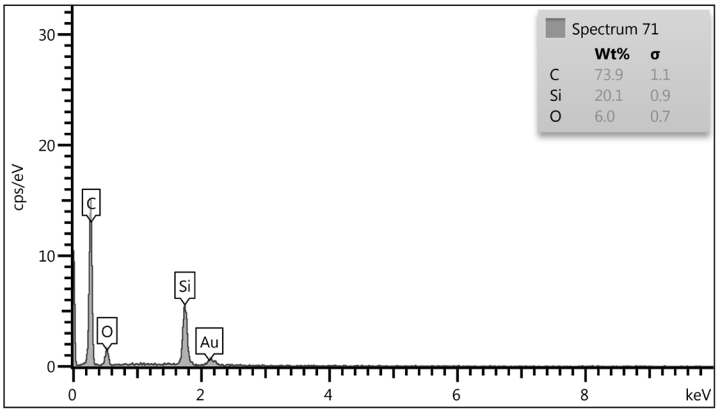


Fig. S 8.75. SEM image with magnifier 5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 71 suggested quartz coverd with organic matter

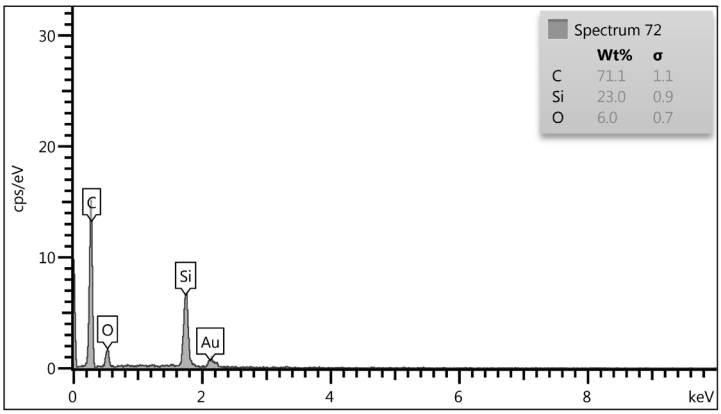


Fig. S 8.76. SEM image with magnifier 5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 72 suggested quartz coverd with organic matter

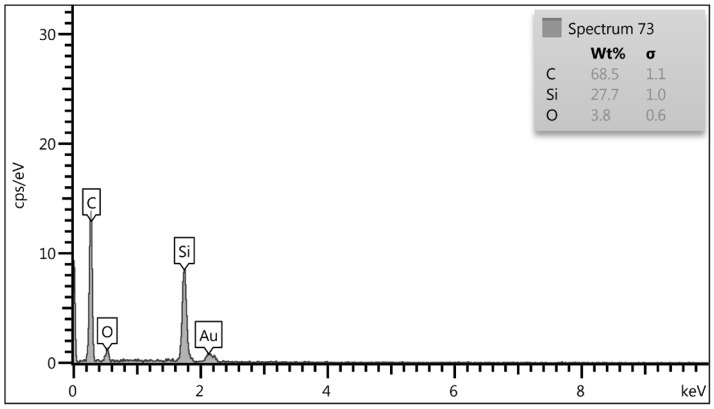
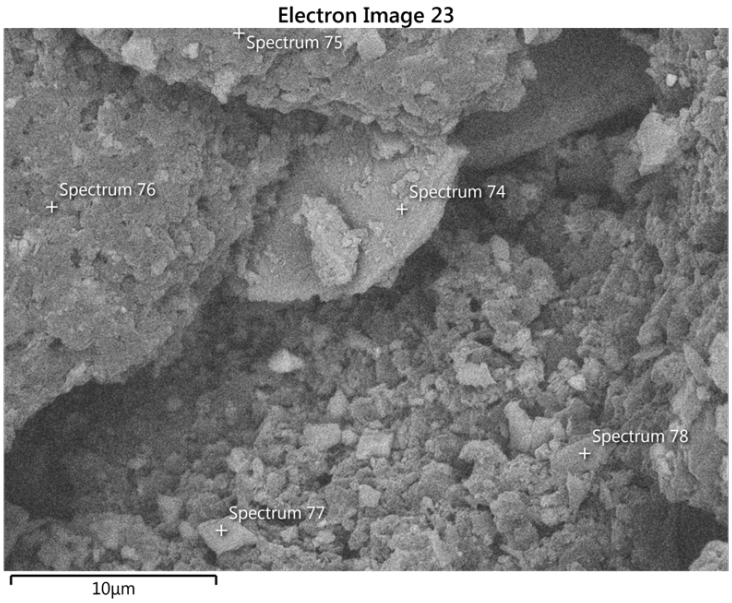


Fig. S 8.77. SEM image with magnifier 5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 73 suggested quartz coverd with organic matter



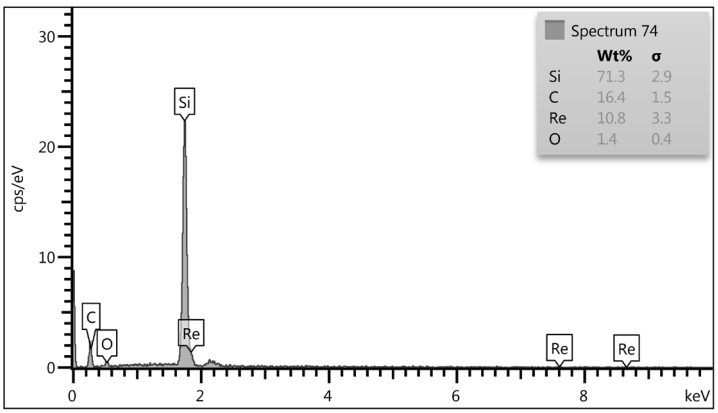


Fig. S 8.78. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 74 suggested quartz, organic matter and Rhenium

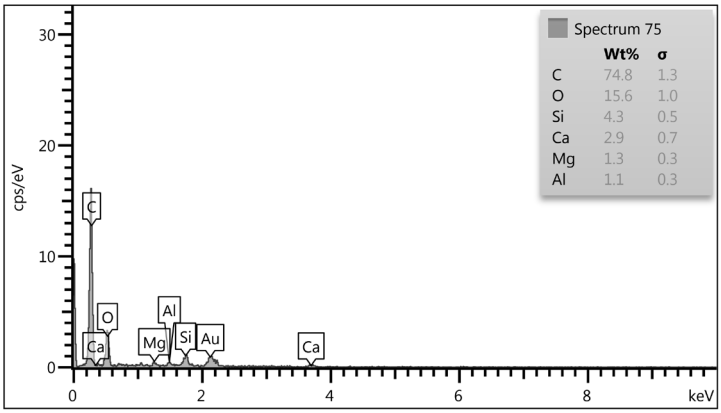


Fig. S 8.79. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 75 suggested high amount of organic matter mixed with quartz, kaolinite and low-magnesium calcite

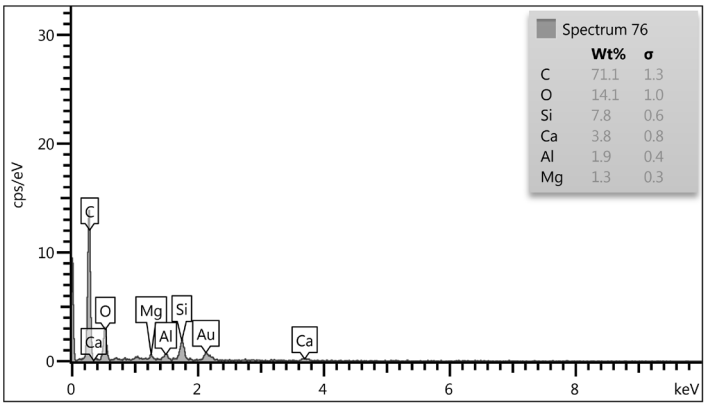


Fig. S 8.80. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 76 suggested high amount of organic matter mixed with quartz, kaolinite and low-magnesium calcite

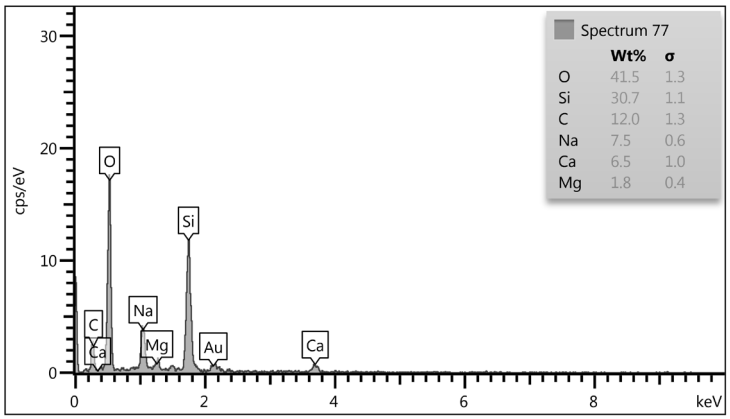


Fig. S 8.81. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 77 suggested quartz and low-magnesium calcite

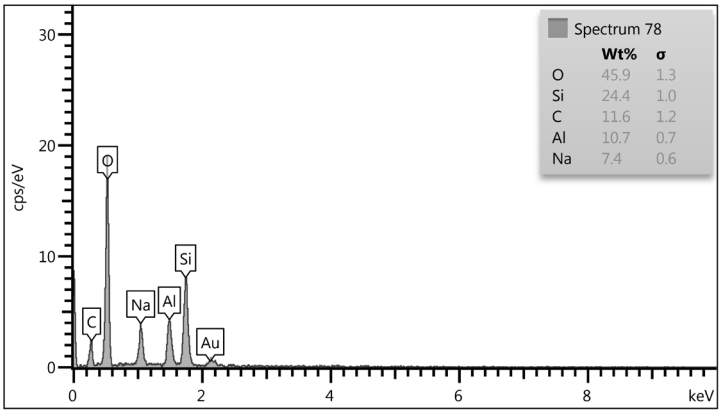


Fig. S 8.82. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 78 suggested quartz, kaolinite and organic matter

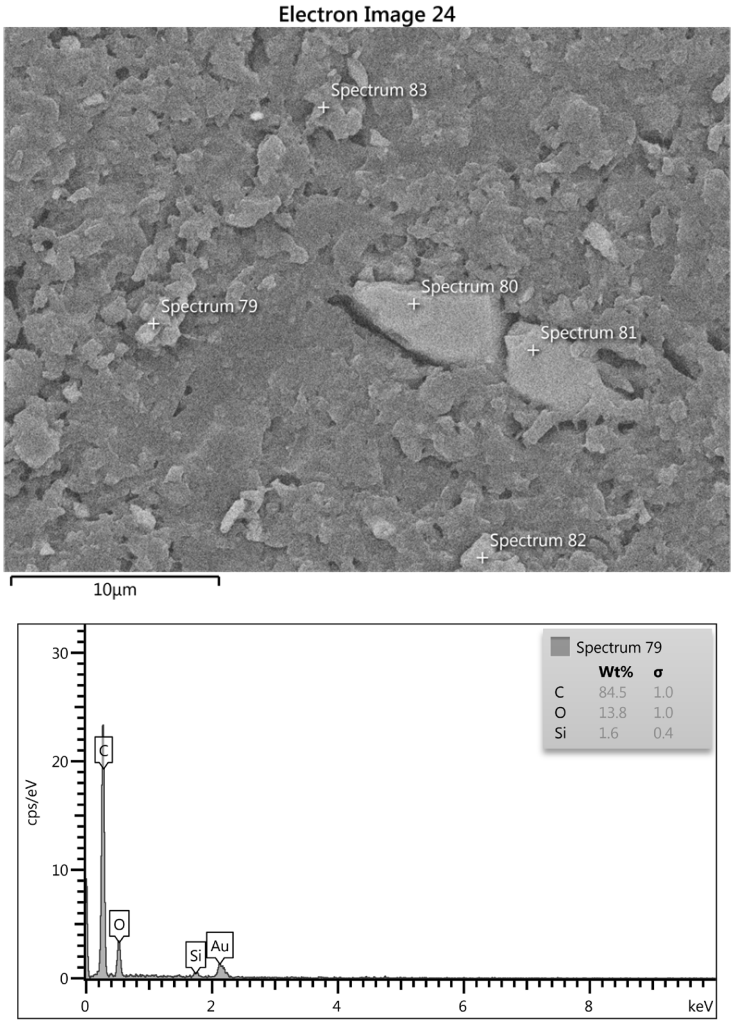


Fig. S 8.83. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 79 suggested high amount of organic matter mixed with quartz

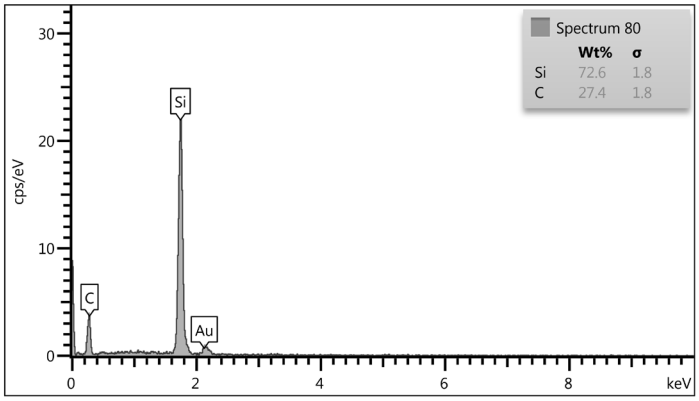


Fig. S 8.84. SEM image with magnifier 5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 80 suggested Moissanite mineral

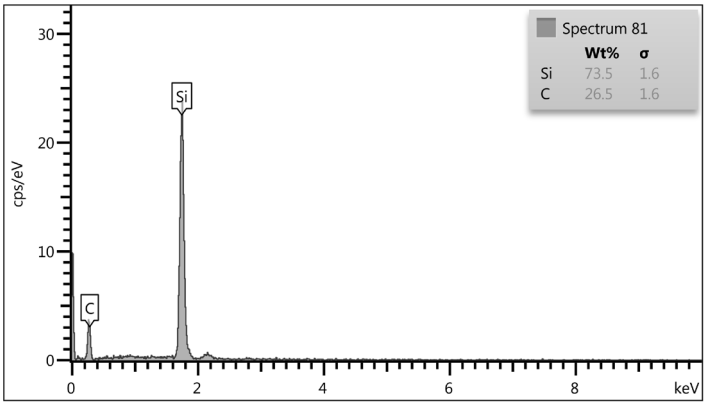


Fig. S 8.85. SEM image with magnifier 5µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 81 suggested Moissanite mineral

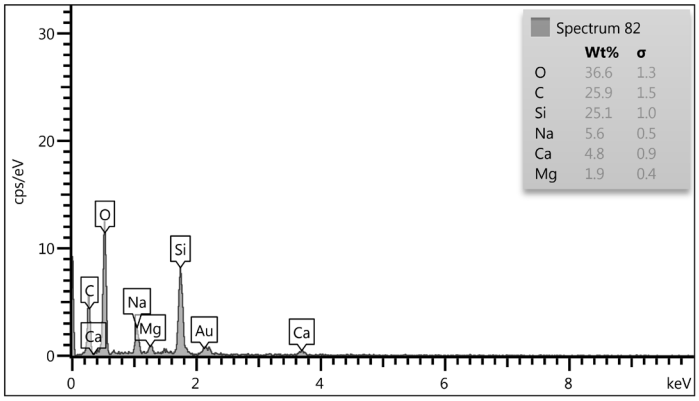


Fig. S 8.86. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 82 suggested quartz, low-magensium calcite and organic matter

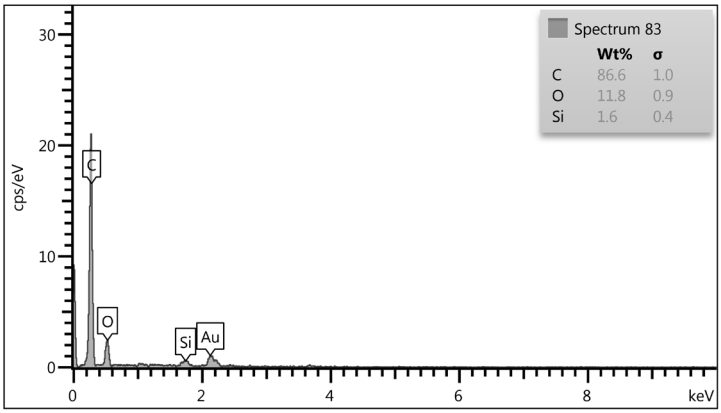


Fig. S 8.87. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 83 suggested quartz, kaolinite and organic matter

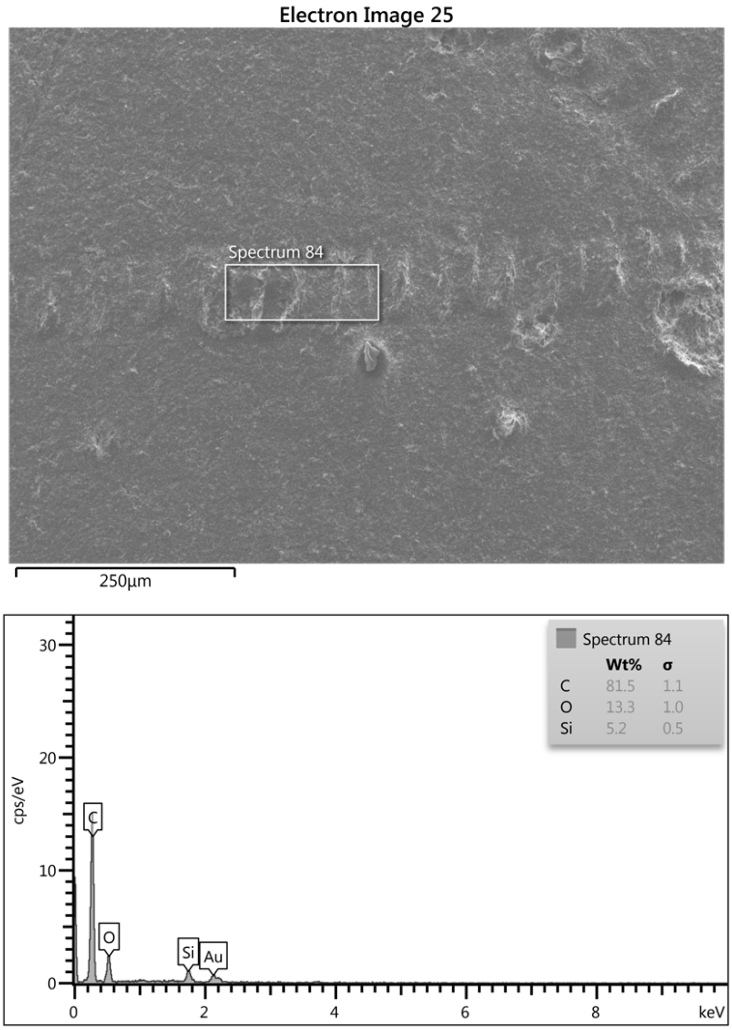


Fig. S 8.88. SEM image with magnifier 250µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 84 suggested quartz, kaolinite and organic matter

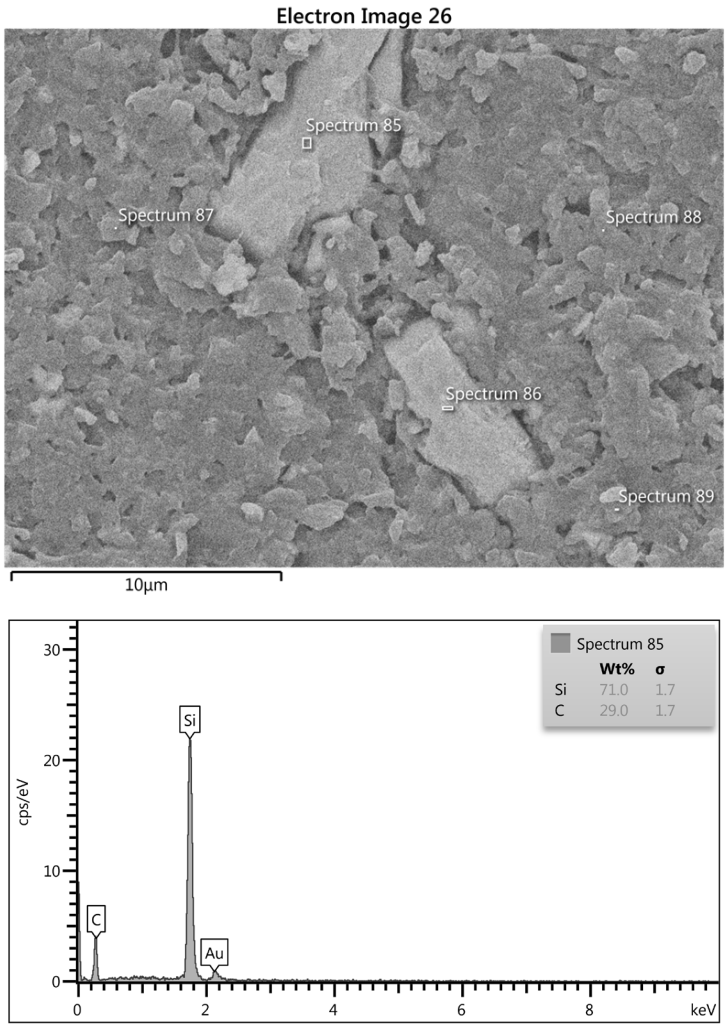


Fig. S 8.89. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 85 suggested Moissanite mineral

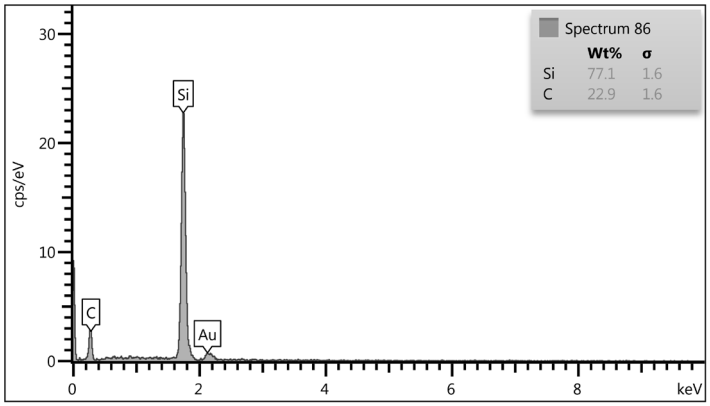


Fig. S 8.90. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 86 suggested Moissanite mineral

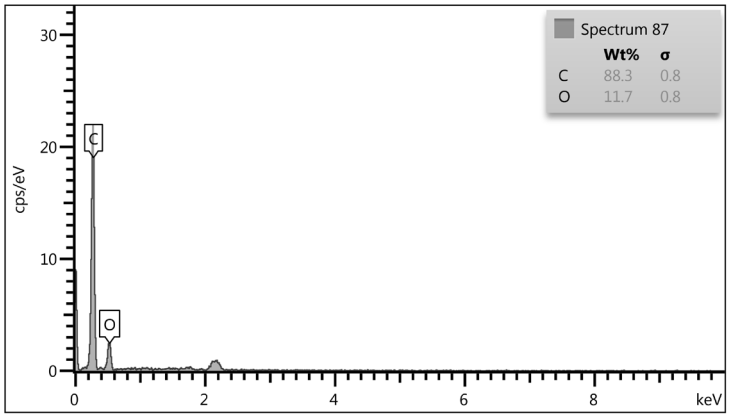


Fig. S 8.91. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 87 suggested organic matter

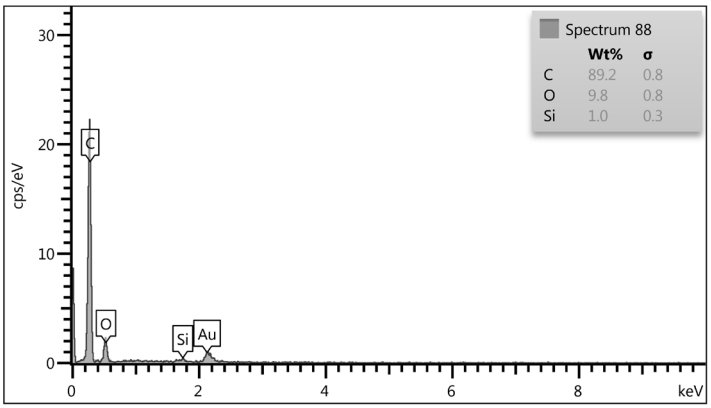


Fig. S 8.92. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 88 suggested organic matter

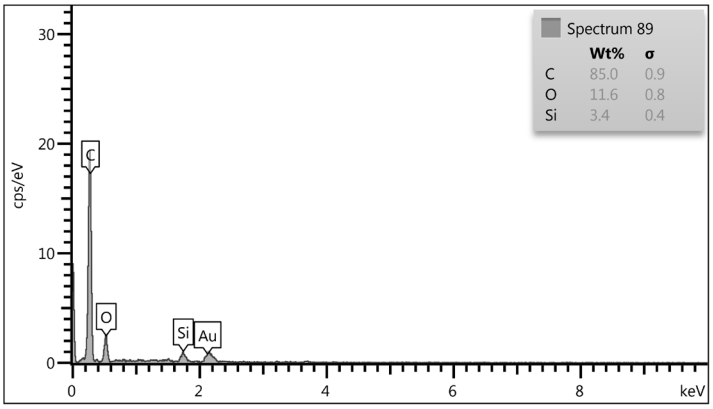


Fig. S 8.93. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 89 suggested organic matter coverd quartz mineral

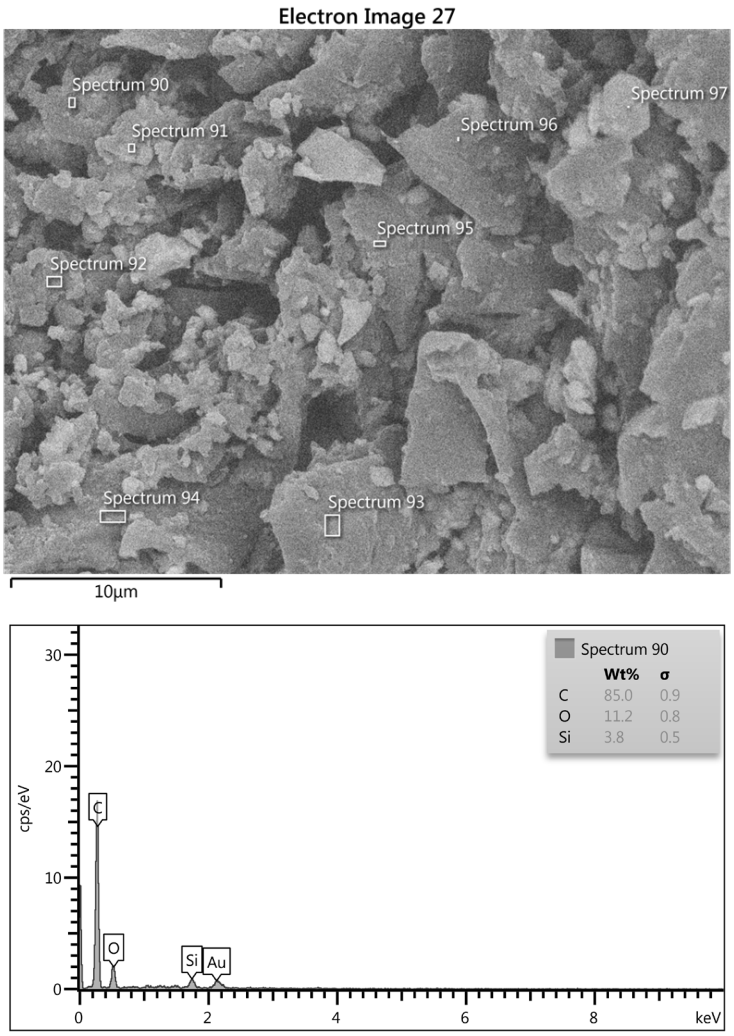


Fig. S 8.94. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 90 suggested organic matter coverd quartz mineral

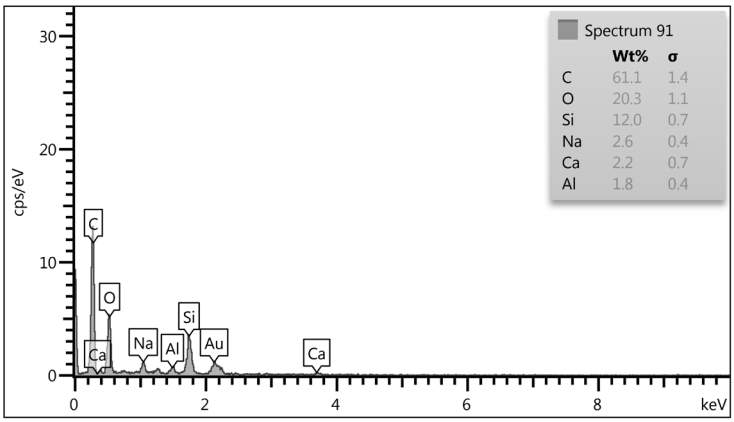


Fig. S 8.95. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 91 suggested organic matter coverd quartz mineral and low-magnesium clasite

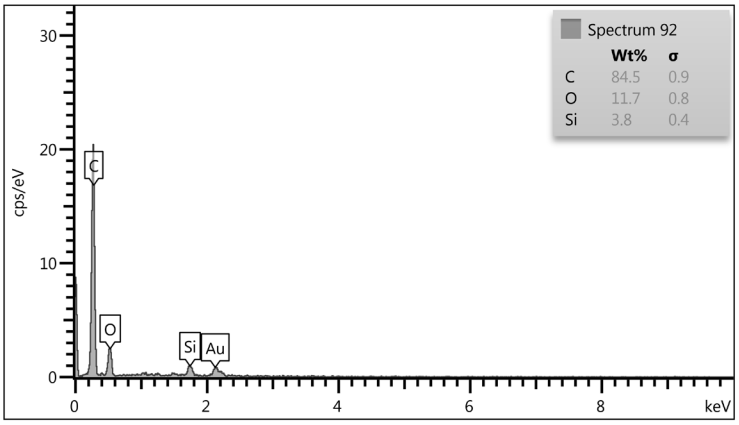


Fig. S 8.96. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 92 suggested organic matter coverd quartz mineral

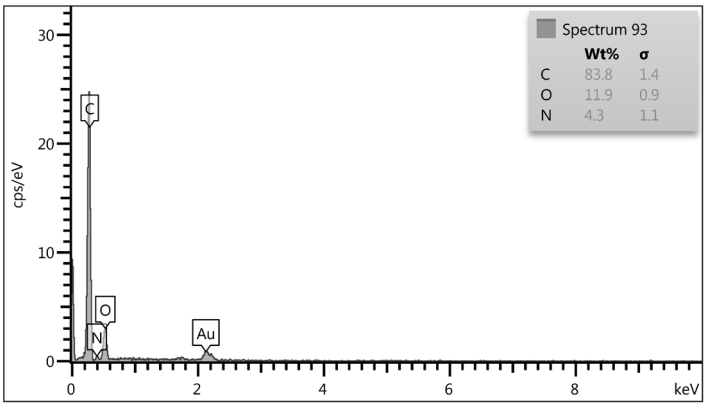


Fig. S 8.97. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 93 suggested organic matter

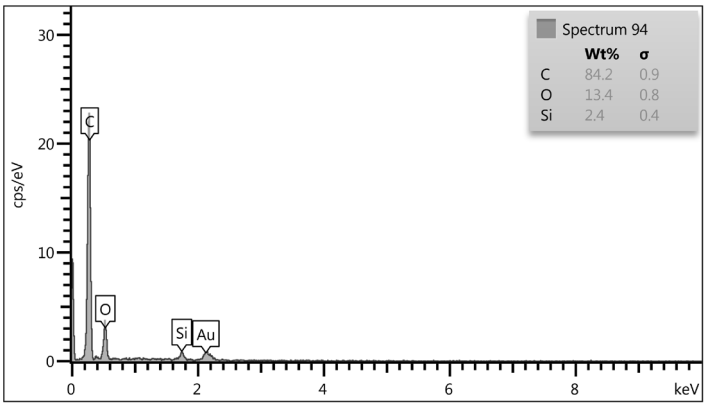


Fig. S 8.98. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 94 suggested organic matter coverd quartz mineral

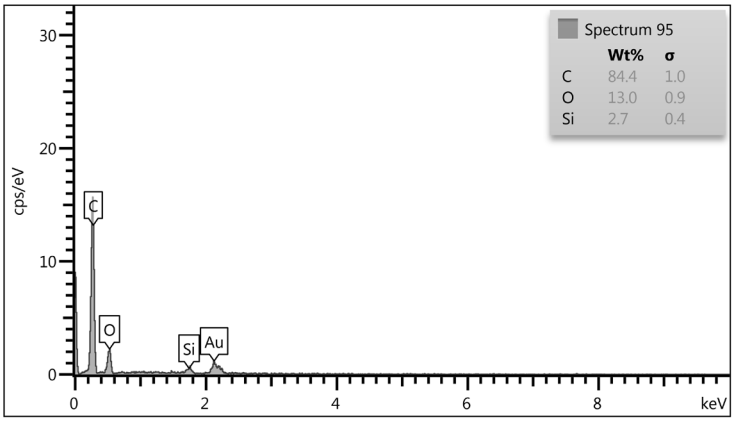


Fig. S 8.99. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 95 suggested organic matter coverd quartz mineral

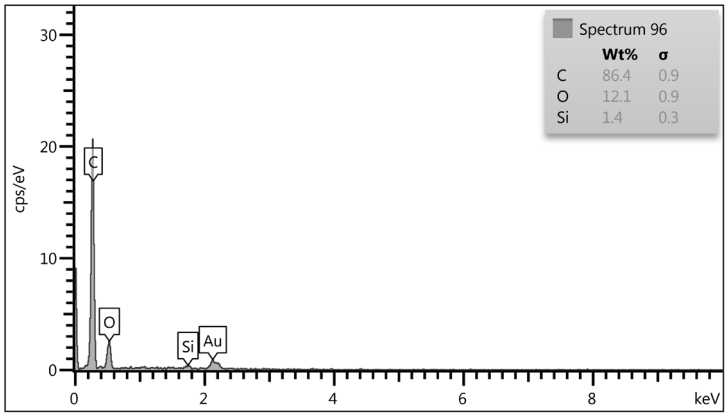


Fig. S 8.100. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 96 suggested organic matter coverd quartz mineral

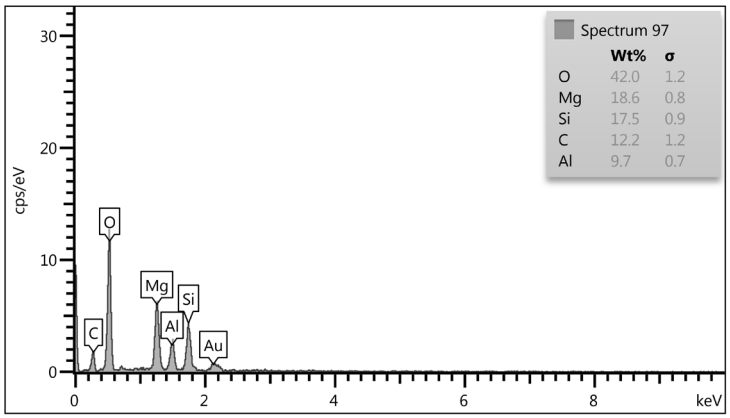


Fig. S 8.101. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 97 suggested Montmorillonite and organic matter

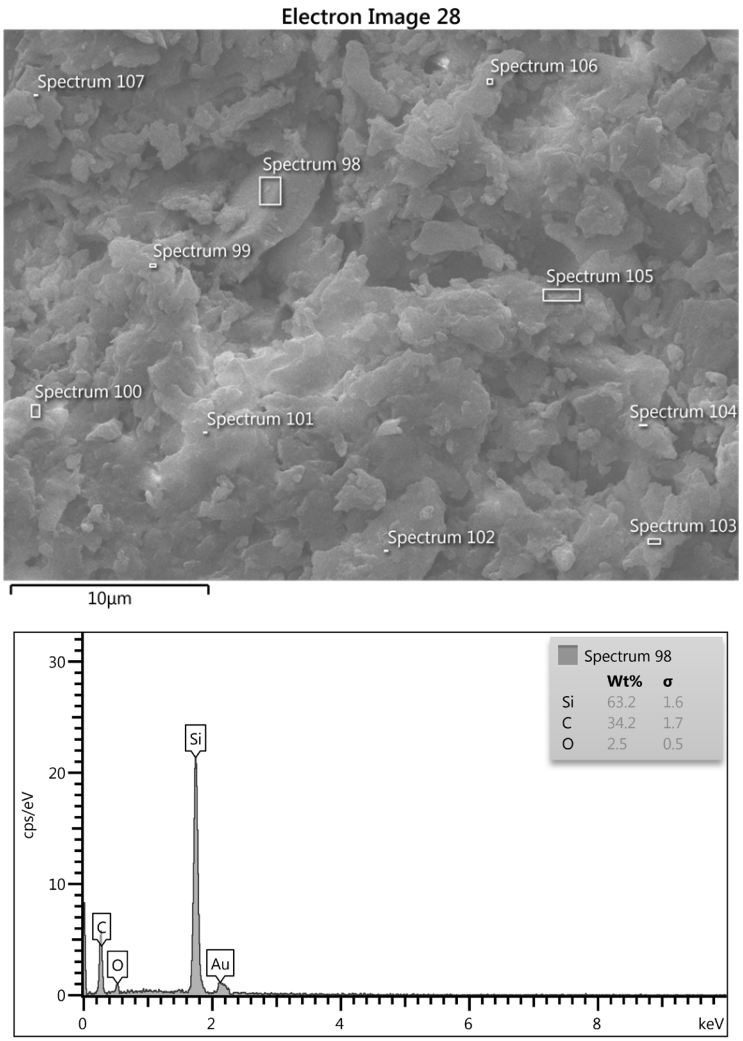


Fig. S 8.102. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 98 suggested Moissanite mineral

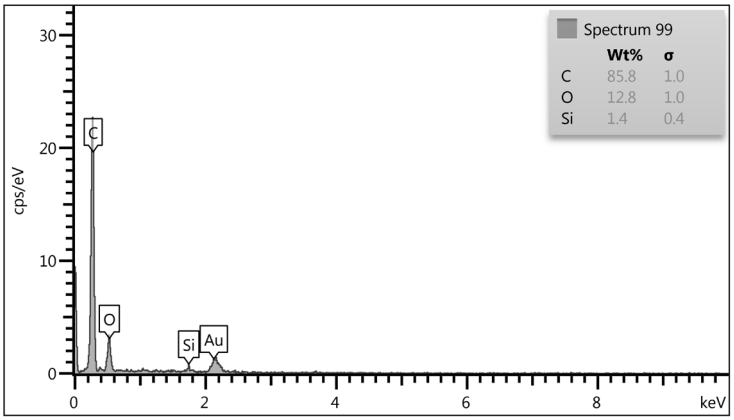


Fig. S 8.103. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 99 suggested organic matter coverd quartz mineral

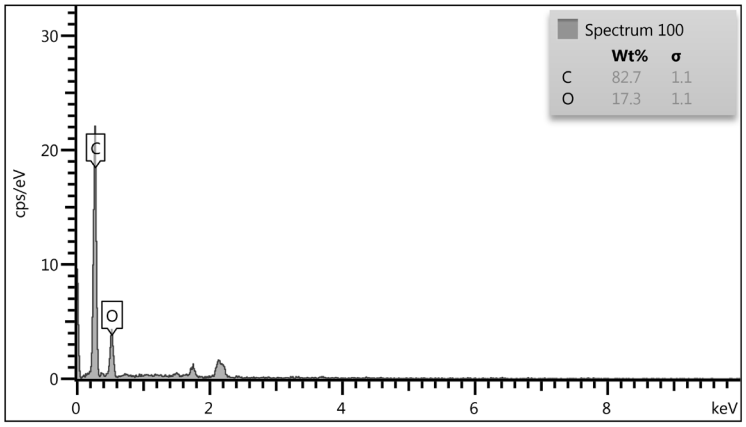


Fig. S 8.104. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 100 suggested organic matter

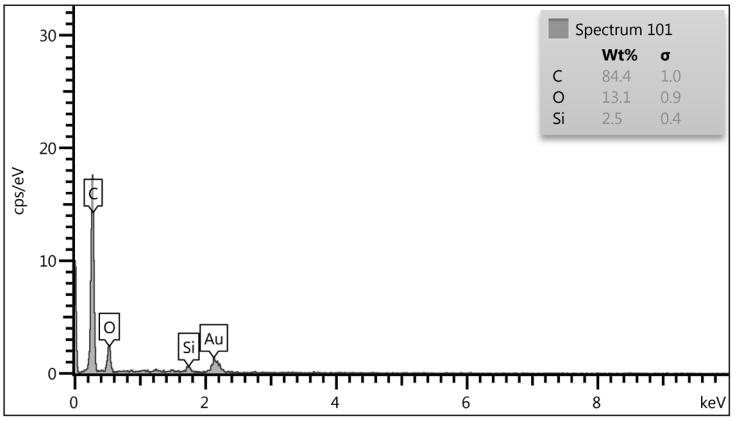


Fig. S 8.105. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 101 suggested organic matter coverd quartz mineral

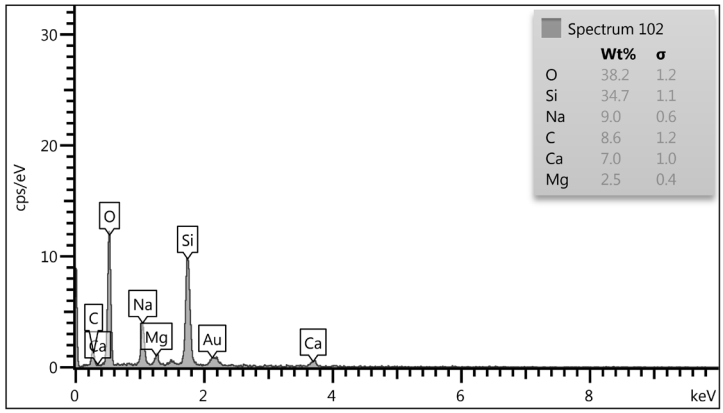


Fig. S 8.106. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 102 suggested low-magnesium calcite and quartz

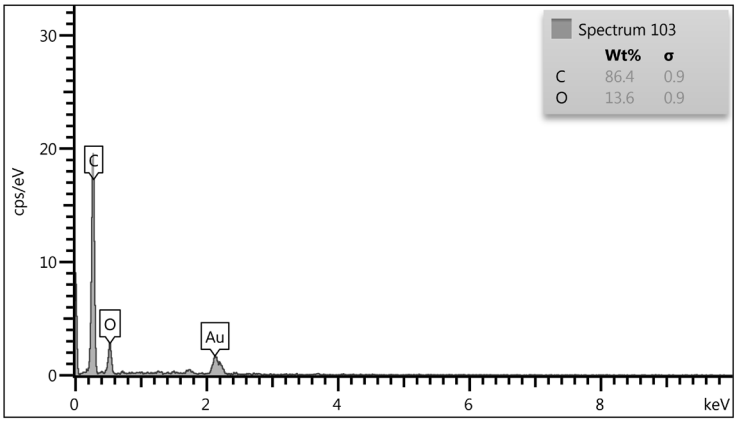


Fig. S 8.107. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 103 suggested organic matter

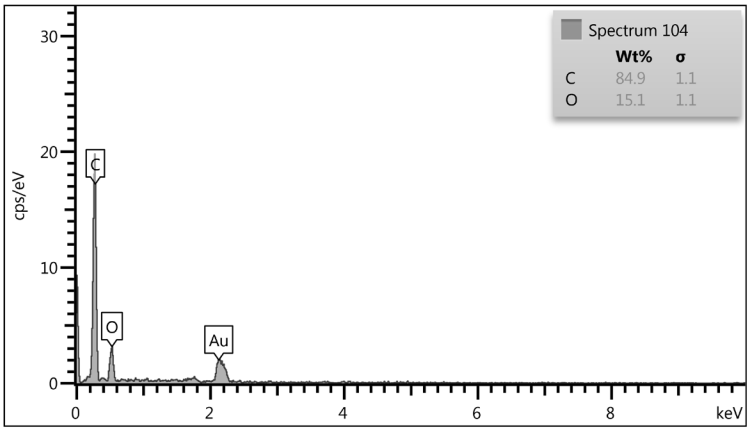


Fig. S 8.108. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 104 suggested organic matter

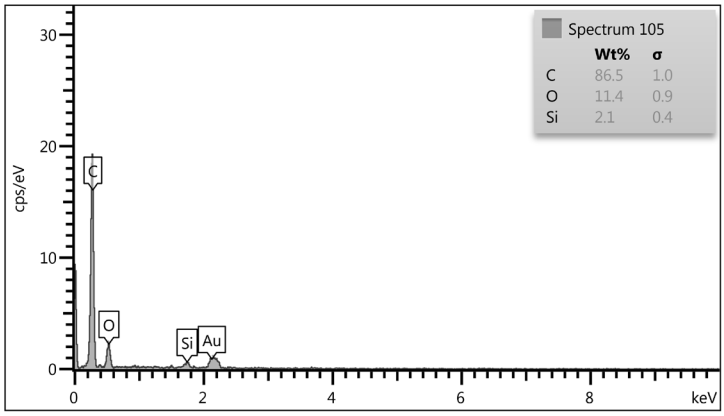


Fig. S 8.109. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 105 suggested organic matter coverd quartz mineral

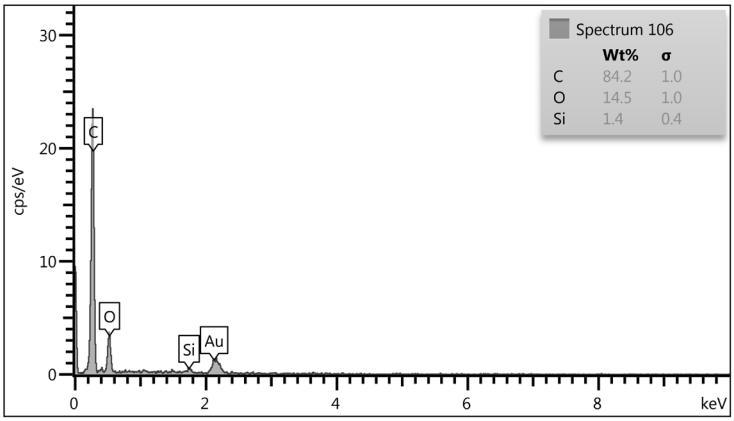


Fig. S 8.110. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 106 suggested organic matter

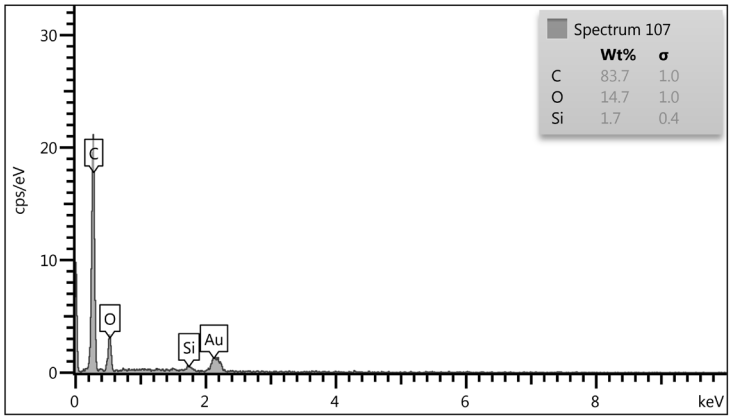


Fig. S 8.111. SEM image with magnifier 10µm for ooid grain mentioned in Fig. S 8.60. EDS analysis for spectrum 107 suggested organic matter

Supplementary Figures 9, Core T5S4

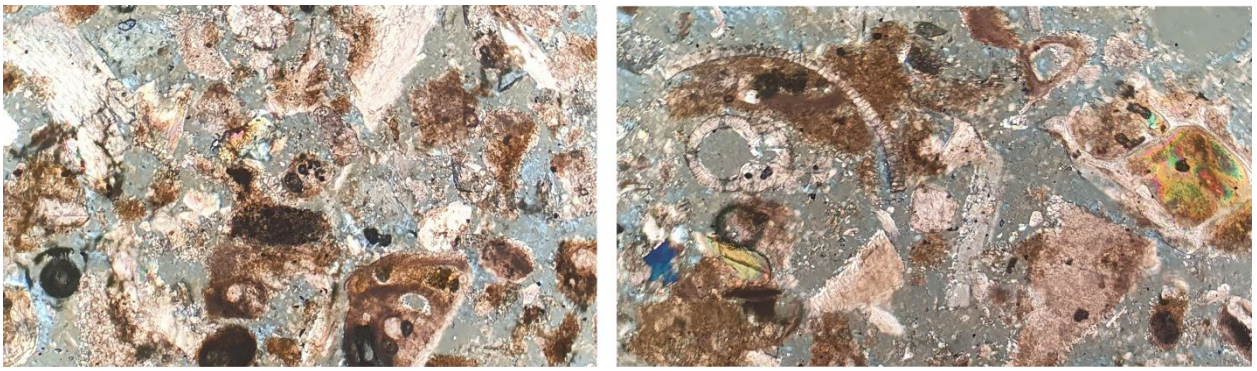


Fig. S 9.1. Thin section photo under cross-polarized light with magnifier 100X for 9-11 cm.

Fig. S 9.2. Binocular microscopy image with magnifier 10X for 9-11 cm.

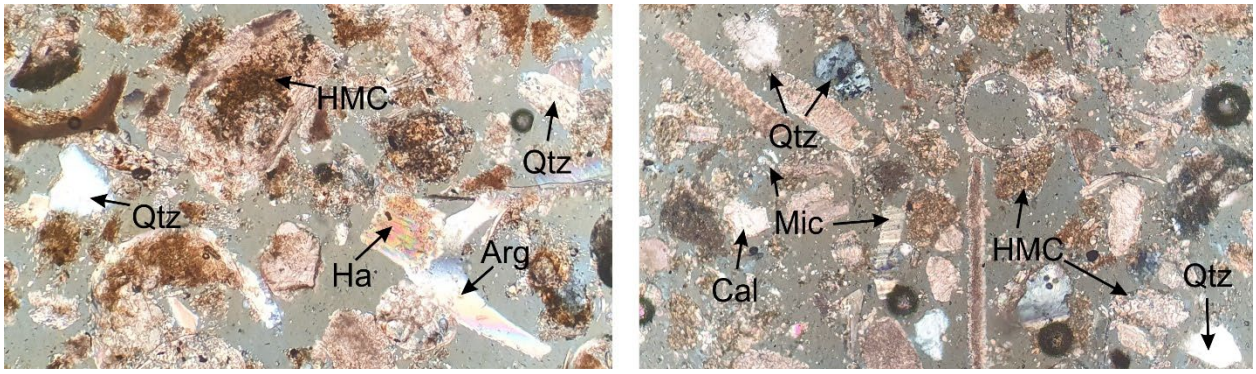


Fig. S 9.3. Thin section photo under cross-polarized light with magnifier 100X for 15-17 cm. Mic: Microcline, Cal: Calcite, Qtz: Quartz, Arg: Aragonite, HMC: High magnesium calcite , Ha: Halite.

Fig. S 9.4. Binocular microscopy with magnifier 10X for 9-11 cm.

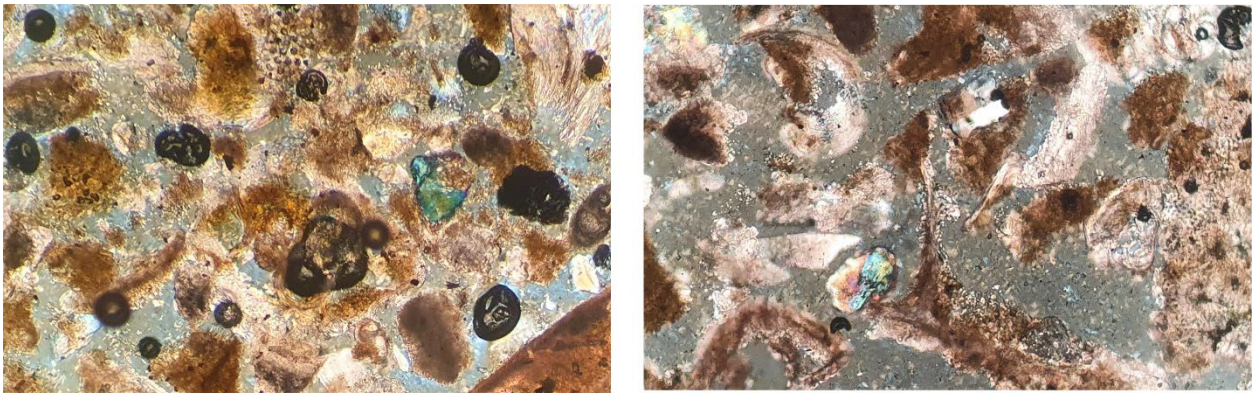


Fig. S 9.5. Thin section photo under cross-polarized light with magnifier 100X for 19-21 cm.

Fig. S 9.6. Binocular microscopy image with magnifier 10X for 9-11 cm.

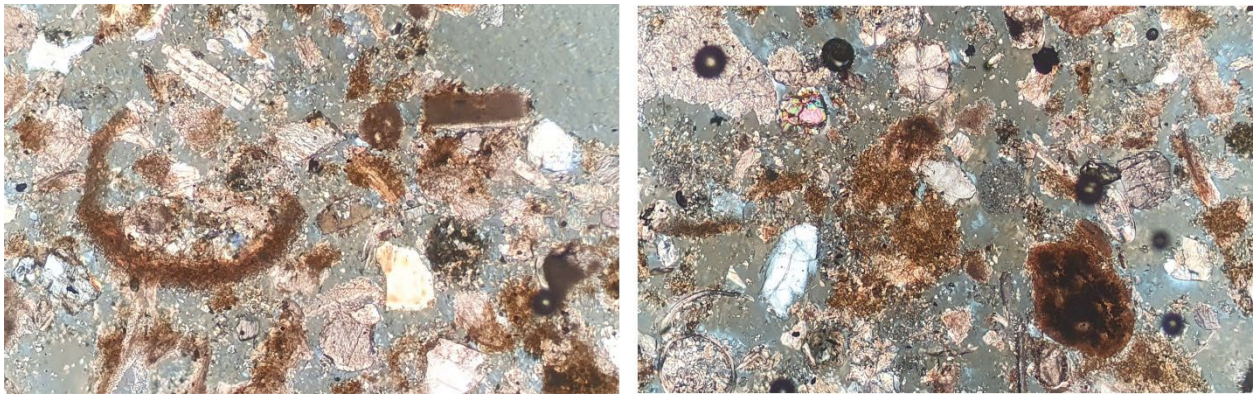


Fig. S 9.7. Thin section photo under cross-polarized light with magnifier 100X for 21-23 cm.

Fig. S 9.8. Binocular microscopy image with magnifier 10X for 9-11 cm.

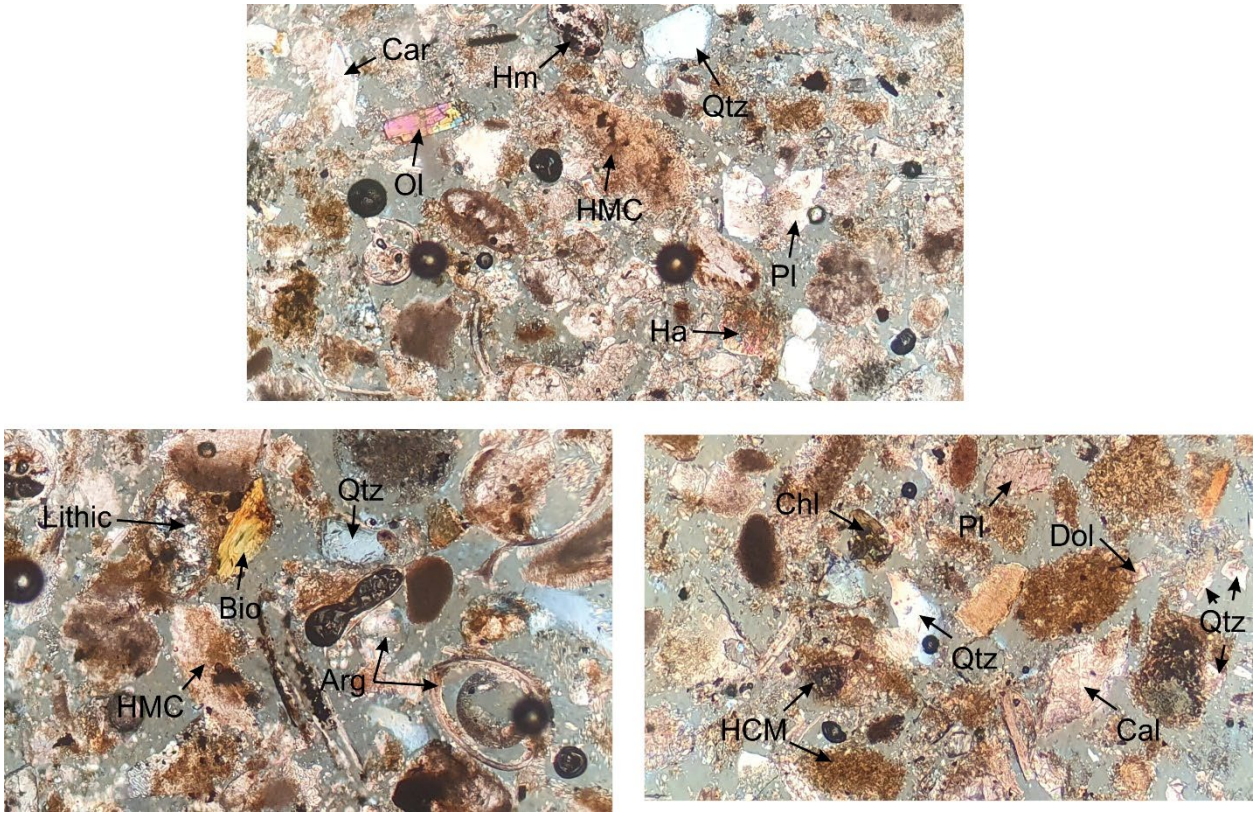


Fig. S 9.9. Thin section photo under cross-polarized light with magnifier 100X for 31-33 cm. Cal: Calcite, Car: Carnallite, Qtz: Quartz, Arg: Aragonite, Hm: Hematite, Pl: Plagioclase, Ol: Olivin, Dol: Dolomite, Chl: Clorite, HMC: High magnesium calcite , Ha: Halite.

Fig. S 9.10. Binocular microscopy image with magnifier 10X for 9-11 cm.