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THE PETROGRAPHICAL PROPERTIES OF THE LATE TRIASSIC–EARLY JURASSIC AGED THE KIZILÖREN FORMATION CARBONATES AROUND AKYOKUŞ-ÇAL DAĞI (KONYA, TÜRKİYE)

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ABSTRACT

The aim of the study, which was carried out in a narrow area (~60 km^2) covering a narrow area around Akyokuş-Çal Mountain (Konya), was to reveal the petrographical properties of the Upper Triassic-Lower Jurassic Kızılören Formation limestones. While the Kızılören Formation carbonates in the region show dolomitization, they do not contain dolostones in our study area and are only found in the form of limestones. The Kızılören Formation, observed as limestones in our study area, presents dark gray, gray-colored, thin-thick bedded levels. The limestones are heavily fractured and veined, brecciated at some levels, and laminated at some levels. According to the thin section analysis, the rock was named mudstone, wackestone, and packstone. While the formation comes with a conformity contact with the Aladağ Formation from the bottom, it has a conformity contact with the Lorasdağı Formation from the top and is unconformity angled with the Sille and Ulumuhsine formations. The thickness of the formation varies between 92m (ÖSK-A) and 116m (ÖSK-B) according to the measured stratigraphic sections. The Kızılören Formation was deposited in a shallow marine environment according to its sedimentological and paleontological characteristics.

Keywords: Kızılören, mudstone, packstone, petrography, wackestone.

INTRODUCTION

The aim of the study, which was carried out in a narrow area (~60 km^2) covering a narrow area around Akyokuş-Çal Mountain (Konya) (Figure 1), was to reveal the petrographical properties of the Upper Triassic-Lower Jurassic Kızılören Formation limestones.

A detailed stratigraphic study was carried out by Karakoç (1996) in the study area and its near surroundings (Figures 2 and 3).

Karakoç (1996) stated that the Aladağ Formation, which is composed of Upper Permian-Upper Triassic red, green, yellow-colored mudstone, quartzite, conglomerate, slate, phyllite, and gray-dark gray crystallized limestone, forms the basis of the study area, the Aladağ Formation was overlain by the

Kızılören Formation, which consists of Upper Triassic-Lower Jurassic dark gray-black colored dolostone, dolomitic limestone, and limestone, the Lorasdağı Formation, consisting of Jurassic-Cretaceous aged light gray-gray colored crystallized limestone, overlies the Kızılören Formation, the Sille Formation, consisting of Late Miocene-Early Pliocene aged brown-red colored conglomerate, sandstone, and mudstone, unconformably overlies the Lorasdağı Formation, she stated that the Ulumuhsine Formation, which is composed of Late Miocene-Early Pliocene aged light brown-dirty yellow clayey limestone, marl, and mudstone, overlies the Sille Formation (Figure 3).

The Kızılören Formation consists of gray, dark gray, black colored, medium-thick bedded, stromatolitic at some levels, laminated dolostone, dolomitic limestone, and limestones (Özkan and Elmas, 2012).

Dolostones commonly observed at the base of the Kızılören Formation are observed as fine-coarse crystalline, dolomicrite, dolosparite, dirty and clear saddle dolomite, void and crack-filled dolomite, and replacement dolomite levels (Özkan and Elmas, 2012).

Kızılören Formation dolomites are mimetic and non-mimetic. The Kızılören Formation, observed as limestones in our study area, presents dark gray, gray-colored, thin-thick bedded levels.

The limestones are heavily fractured and veined, brecciated at some levels (A-5, A-8, B-1), and laminated at some levels (A-24). According to the thin section investigates, the rock was named mudstone, wackestone, and packstone.

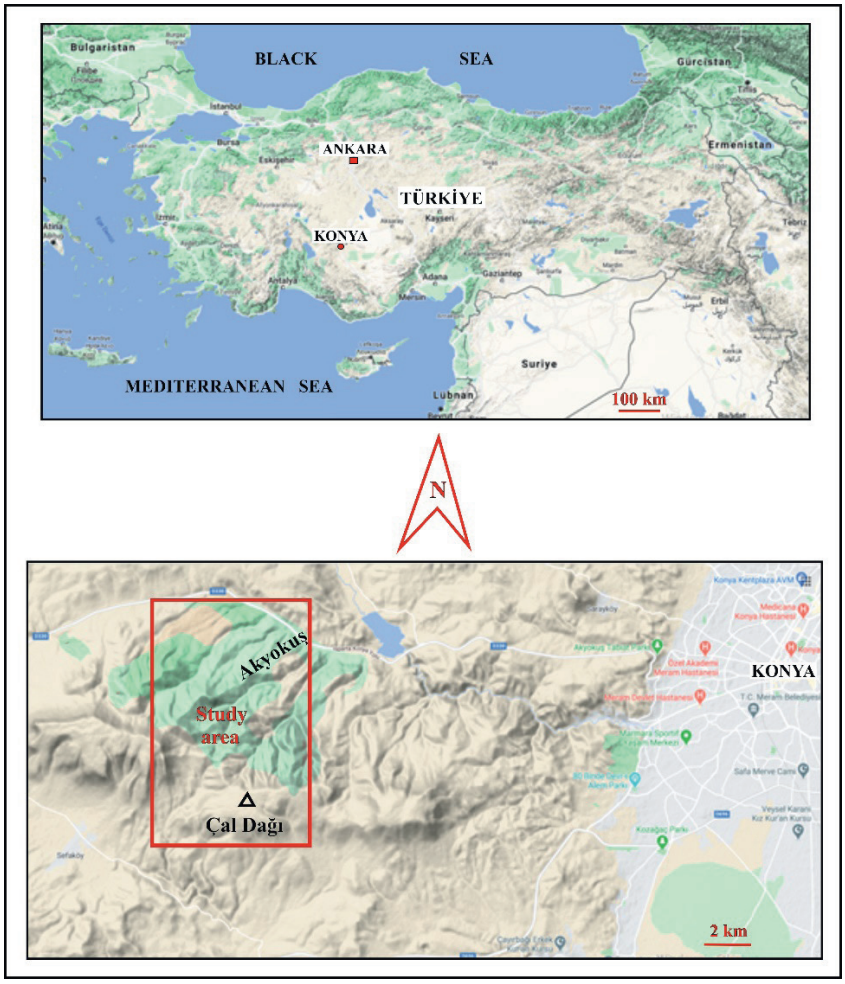

Figure 1. Location map of the study area (Google Maps)

While the formation conformably overlies the Aladağ Formation from the bottom, it has a conformity contact with the Lorasdağı Formation from above and is unconformity angled with the Sille and Ulumuhsine formations (Figures 2, 3). While the thickness of the formation varies between 92 m (ÖSK-A; Figure 4) and 116 m (ÖSK-B; Figure 5) according to the measured stratigraphic sections, Karakoç (1996) stated that it is 300 m thick. The age of the Kızılören Formation was determined as Late Triassic-Early Jurassic by Karakoç (1996), and in this study, the age of the unit was evaluated as Late Triassic-Early Jurassic. The Kızılören Formation was deposited in a shallow marine environment according to its sedimentological and paleontological characteristics.

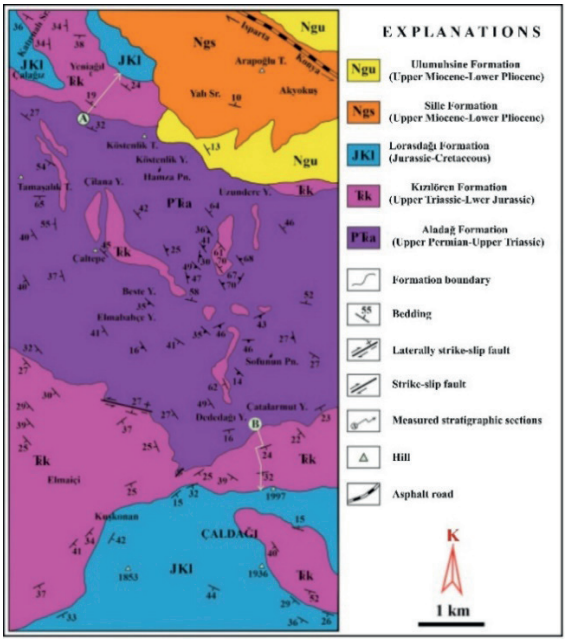

Figure 2. Geological map of the study area (modified from Karakoç, 1996)

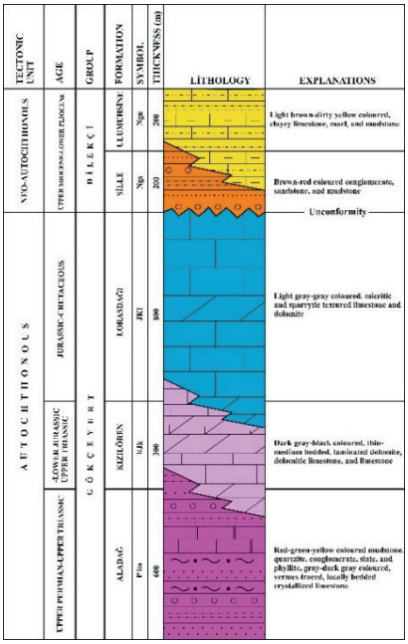

Figure 3. Stratigraphic colon section of the study area (modified from Karakoç, 1996)

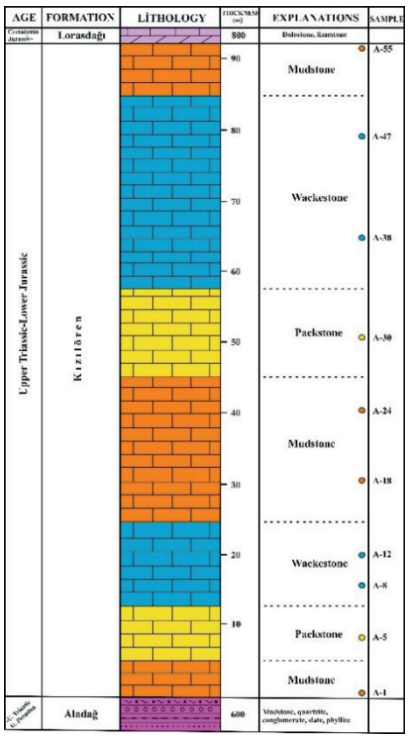

Figure 4. The Köstenliktepe stratigraphic section

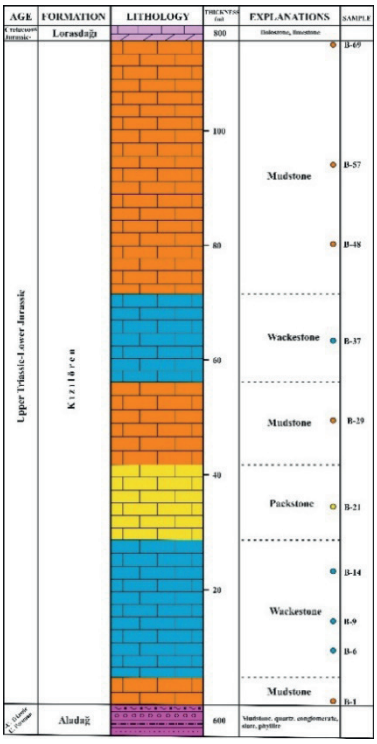

Figure 5. The Çaldağı stratigraphic section

MATERIALS AND METHODS

Limestone samples from the Kızılören Formation represent the material in the study area. 20 systematic samples were taken along the measured stratigraphic section from two areas where the limestones of the Kızılören Formation are best exposed. Thin section construction of the Kızılören samples was made in Pamukkale University Faculty of Engineering, Department of Geological Engineering. Alizarin red was used to distinguish between dolomite and calcite. Dunham's (1962) classification was used for microfacies nomenclature of Kızılören limestone samples.

RESULTS AND DISCUSSION

According to the microscopic examination of the samples taken from the Köstenliktepe measured stratigraphy section of the Kızılören Formation (Figure 4), the Kızılören Formation is observed as mudstone (Figure 6a) at the base (sample: A-1). In the sample taken from this level, 8% fossil, 91% micrite, 1% porosity, and sparry-calcitic veins (Figure 6a) were observed. There are also areas of neomorphic microspar development in this sample. The Kızılören Formation A-5 sample is packstone (Figure 6b), contains 15% fossils, 20% intraclasts, 65% micrite, and sparry-calcitic veins, and also presents a brecciated texture. The Kızılören Formation A-8 sample is wackestone (Figure 6c-e) and contains 12% fossil, 81% micrite, 5% sparry calcite cement, and 2% porosity, sparry-calcitic veins (Figure 6c), micro faulting (Figure 6e), stylolite and stylolitic porosity are observed. The Kızılören Formation A-12 sample is also wackestone (Figure 6f) and contains 25% fossil, 3% dolomite, 68% micrite, and 4% sparry calcite cement. The dolomites in this sample are very fine-crystalline and xenotopic in shape, and stylolite development has also been observed in places. The Kızılören Formation A-18 sample is mudstone (Figure 6g,h) and contains 3% fossil, 5% dolomite, 91% micrite, and 1% porosity. It is laminated at some levels (Figure 6g,h) and has dense sparry-calcitic veins. The dolomites are very fine crystalline and xenotopic. The Kızılören Formation A-24 sample is also mudstone (Figure 6i) and contains 5% fossils, 1% opaque minerals, 1% dolomite, and 93% micrite. Tepee structure (Figure 6i) was also observed at this level, which is characterized by laminated mudstone. The dolomites in this sample are also very fine crystalline and xenotopic in texture. The Kızılören Formation A-30 sample is packstone (Figure 6j,k) and 38% fossil, 57% micrite, and 5% sparry calcite cement were observed. Sample A-38 of the Kızılören Formation has wackestone characteristics and 14% fossil, 81% micrite, 4% sparry calcite cement, and 1% opaque mineral (Figure 6l) are observed. Sparry-calcitic veins (Figure 6l,m) are also visible at this level. Sample A-47 of the Kızılören Formation has wackestone characteristics and 15% fossil, 66% micrite, 7% sparry calcite cement and 12% porosity are observed. Sample A-55 from the Kızılören Formation is mudstone (Figure 6n) and contains 8% fossil, 86% micrite, 5% sparyte, and 1% porosity. Intersecting stylolites and unidentified fossils (Figure 6n) were observed in this sample.

According to the microscopic examination of the samples taken from the Çaldağı measured stratigraphy section of the Kızılören Formation (Figure 5), the Kızılören Formation begins at the base (sample: B-1) as mudstone (Figure 7a,b) and consists of 5% fossil, 90% micrite, 4% sparry calcite cement, and 1% porosity. Sample B-6 of the Kızılören Formation is wackestone (Figure 7c-e) and contains 12% fossil, 84% micrite, 2% sparry calcite cement, and 2% porosity. In the sample, stylolitic porosity and ghost fossil (Figure 7c), and fossil-bioclast (Figure 7d,e) were also observed. Sample B-9 of the Kızılören Formation is wackestone (Figure 7f,g) and contains 15% fossil, 74% micrite, 8% dolomite, and 1% sparry calcite cement, 2% porosity. Sample B-14 of the Kızılören Formation is wackestone (Figure 7h,i) and contains 14% fossil (Figure 7h), 77% micrite, 3% sparry calcite cement (Figure 7i), 4% dolomite, 2% porosity. Sample B-21 of the Kızılören Formation has the characteristics of packstone (Figures 7j,k) and contains 38% fossil, 57% micrite, 3% dolomite, and 2% porosity. Sample B-29 from the Kızılören Formation is mudstone (Figure 7l,m) and contains 8% fossil, 80% micrite, 10% sparry calcite cement, 2% porosity, and sparry-calcitic and opaque mineral-filled veins (Figure 7l,m). Sample B-37 of the Kızılören Formation is wackestone (Figure 7n,o) and contains 5% fossil, 18% pellet, 71%

micrite, and 3% sparry calcite cement, 1% opaque mineral, 2% porosity. In the sample, stylolite and sparry-calcitic vein (Figure 7n) and ghost fossil and fissure porosity (Figure 7n) were observed. Sample B-48 of the Kızılören Formation is mudstone (Figure 7p) and contains 85% micrite and 15% porosity. Neomorphic microsparytic (Figure 7p) areas were also observed in the sample. Sample B-57 of the Kızılören Formation is mudstone (Figure 7r,s) and contains 9% fossil, 72% micrite, and 19% porosity (eg. shelter porosity; Figure 7r). Sample B-69 of the Kızılören Formation has mudstone characteristics and includes 88% micrite, 12% porosity, and neomorphic microsparycalcitic areas.

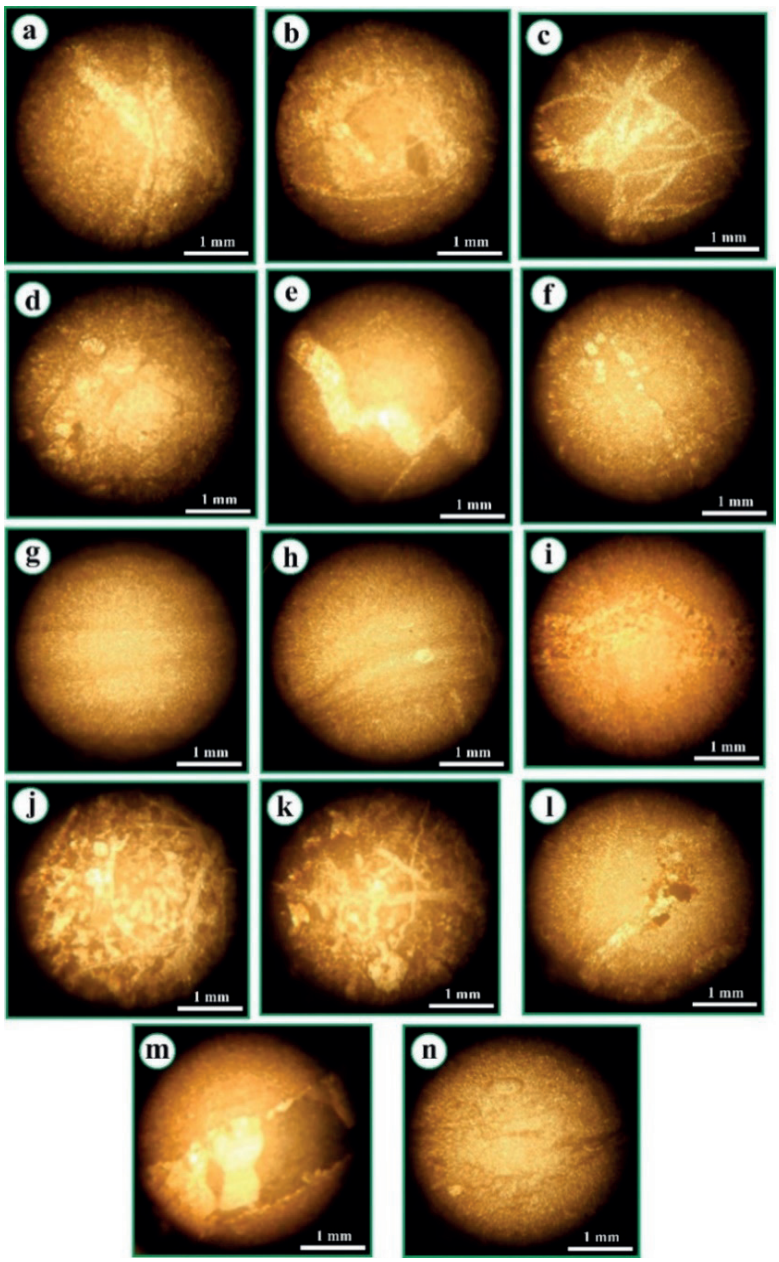

Figure 6. Microscopic photographs of the measured stratigraphic section samples of the Kızılören Formation Köstenliktepe. a) micrite and intersecting sparry-calcitic veins PPL (A-1). b) fossil, intraclast, micrite, sparry-calcitic vein PPL (A-5). c) micrite and intersecting sparry-calcitic veins, PPL (A-8). d) fossils, micrite, PPL (A-8). e) fossil, micrite, sparry-calcitic microfaulted vein PPL (A-8). f) abundant fossils, micrite PPL (A-8). g) fossiliferous and laminated micrite PPL (A-18). h) fossiliferous and laminated micrite PPL (A-18). i) tepee structure, micrite PPL (A-24). j) fossil, pellet, micrite, sparry-calcitic vein PPL (A-30). k) fossil, pellet, micrite, sparry-calcitic vein PPL (A-30). l) fossil, opaque mineral, micrite, sparry-calcitic vein PPL (A-38). m) micrite, sparry-calcitic vein XPL (A-38). n) fossil, micrite, intersecting stylolites PPL (A-55)

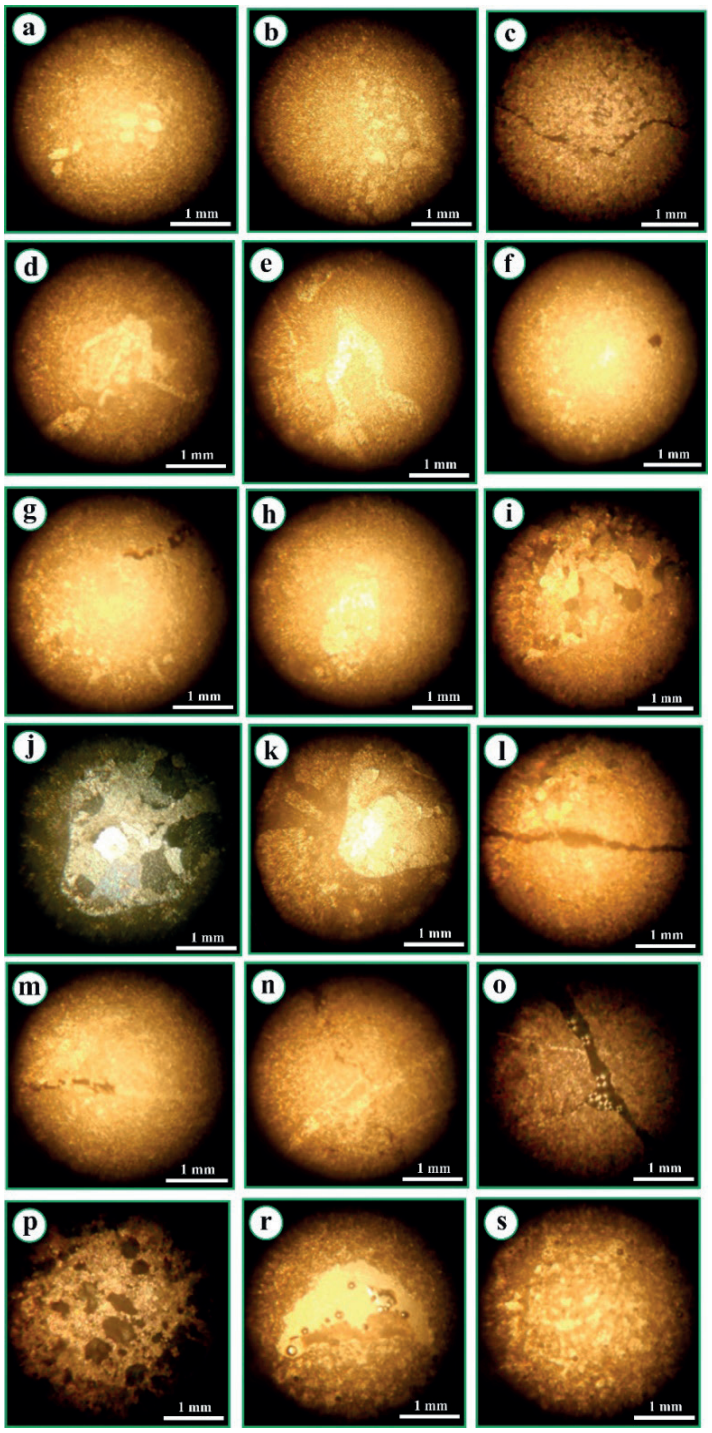

Figure 7. Microscopic photographs of the Çaldağı measured stratigraphic section samples from the Kızılören Formation. a) fossil, micrite, microspar PPL (B-1). b) fossil, micrite, microspar PPL (B-1). c) ghost fossil, micrite, stylolitic porosity PPL (B-6). d) fossil-bioclast, micrite PPL (B-6). e) fossil, micrite, sparry-calcitic vein PPL (B-6). f) fossil-bioclast, opaque mineral, micrite PPL (B-9). g) fossil, opaque mineral, micrite PPL (B-9). h) fossil, micrite PPL (B-14). i) void-filled sparry calcite cement, micrite XPL (B-14). j) fossil, micrite XPL (B-21). k) fossil, micrite PPL (B-21). l) fossil-bioclast, micrite, partly opaque mineral-partly sparry calcite-filled stylolite XPL (B-29). m) fossil-bioclast, micrite, partly opaque mineral-partly sparry calcite-filled stylolite PPL. (B-29). n) pellet, micrite, stylolite PPL (B-37). o) fossil, pellet, fissure porosity, micrite, sparry-calcitic vein XPL (B-37). p) porosity, micrite, neomorphic microsparry calcite XPL (B-48). r) porosity, micrite, neomorphic microsparry calcite PPL (B-57). s) fossil, porosity, micrite, neomorphic microsparry calcite PPL (B-57)

CONCLUSION

The Kızılören Formation was deposited in a shallow marine environment according to its sedimentological and paleontological characteristics.

The neomorphic spar calcites observed in the Kızılören Formation were developed as a result of dissolution and redeposition during the diagenetic process.

The breccias in the Kızılören limestones were formed as monomict breccia. They were developed by the disintegration and redeposition of tidal flat carbonate mudstones.

The stylolites observed in the Kızılören limestone samples were formed as a result of lithostatic pressure dissolution in the shallow-medium depth burial environment.

The tepee structures are sedimentary structures representing the formation in peritidal environments, and they develop largely as a result of the evaporation of water and subsequent precipitation of minerals in the sediment.

Therefore, the tepee structures observed in the Kızılören limestones were formed as a result of the evaporation and mineral precipitation of carbonate muds in the peritidal environment.

The dolomitization in Kızılören carbonates has developed as a result of the replacement of limestone with pore fluids containing seawater trapped in a shallow burial environment.

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