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Micromorphology and submicroscopy of a mature calcrete, Isfahan, central Iran

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Calcrete is defined as terrestrial accumulation of secondary carbonates and expansion of calcretes in arid and semi-arid regions provides an opportunity to use its properties for paleoenvironmental reconstructions. Different models and mechanisms are suggested for calcrete formation in soils and sediments. A mature calcrete with advanced morphology stage (stage IV) in hyper-arid regions (precipitation less than 100mm yearly) of eastern Isfahan, central Iran, have selected to study. Formation of this calcrete is attributed to middle and late Quaternary (Bayat et al., 2018). Dominance of calcareous parent materials and deep depth of ground water suggest that per descendum model is responsible in the formation of the calcrete. Because top of the calcrete is the most active part based on per descendum model, samples were taken from top 15cm of the calcrete. For micromorphological analyses polarizan microscope and scanning electron microscopy (SEM) were used. Results show that the b-fabric is crystallitic and voids are filled by microsparic and sparitic crystals of calcite. In addition, the occurrence of iron/manganese nodules is indicator of reduction conditions during periods of the calcrete formation. SEM images indicate occurrence of sparitic rhombohedral crystals with sharp edges which are formed during long-term stability and suitable conditions, rhombic crystals are covered by micritic and microsparitic crystals of calcite which indicate multiple stages of calcrete formation. Formation and development of this calcrete in hyper-arid regions of central Iran highlight profound climatic change during middle and late Quaternary.