



Occurrence of celestite in arid soils of southern Iran

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Celestite (SrSO_4) is a common mineral in marine sediments, occurring as linings or fracture fillings or as nodules in dolomites and limestones. It is often closely associated with gypsum and other evaporite minerals (Baker and Bloomer, 1988). In soils, authigenic celestite was first reported by Barzanji and Stoops (1974) in gypsic and petrogypsic horizons. This paragenesis was later confirmed by several authors in different arid regions. Weak XRD peaks of celestite were reported in soils of southern Iran (Abtahi, *et al.*, 1980).

The study area (Fars Province) is a part of the Post-Tethyan Sea environment which is rich in evaporites (salts and gypsum) in most of the southern and south-eastern parts. The presence of celestite as an evaporite mineral was reported in some of these gypsiferous and calcareous geological formations (James and Wynd, 1965). Soils of the study area are all calcareous. Saline and gypsiferous soils are dominant in the most arid parts of the area. Fifteen profiles were selected after a detailed soil survey. The soils can be classified into three categories: 1°. well-drained soils with only calcic horizons formed at the xeric border to aridic regions, 2° well-drained soils with gypsic horizons formed in aridic areas and 3°. poorly drained soils with gypsic and salic horizons formed in xeric and aridic regions. Celestite was only observed within the soils of the second group. No celestite was observed in the poorly drained soils and/or soils free of gypsum.

Thin sections were studied according to the methods proposed by Stoops (2003) with a polarizing microscope. Celestite occurs as euhedral prismatic grains (approximately 50-70 μm long, with lozenge shaped cross section) forming dense incomplete infillings of voids. The distribution of celestite crystals in voids and especially in channels proves their pedogenic origin. Microprobe studies confirm the presence of Sr. Celestite emits a moderate blue fluorescent light under the UV light in the studied thin sections,

whereas gypsum does not react.

The close relationship of celestite with gypsic horizons was previously reported by Stoops and Delvigne (1990). The soils showing celestite in their thin sections have formed near the geological formations containing this mineral, from which Sr could be inherited to the soils. Absence of celestite in poorly drained gypsiferous soils could indicate that this mineral is not stable in poorly drained conditions with the soil solution high in Ca^{++} , SO_4^{--} , Mg^{++} and other ions, or that it does not form there. It is not clear in howfar the soil solution chemistry plays a major role in the occurrence of celestite in soils. The presence of Sr^{++} in such conditions (e.g. in the calcite lattice) that it can react with SO_4^{--} upon liberation could be more important.

References

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