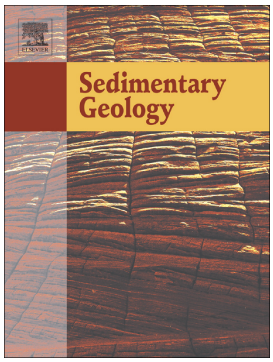

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Diagenetic evolution of the upper Devonian phosphorites, Alborz Mountain Range, northern Iran

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Abstract

The upper Devonian, mixed siliciclastic-carbonate stratigraphic succession of the Geirud Formation in the Alborz Mountain Range, north of Iran, hosts numerous phosphorites and phosphatic rocks. These phosphorites, which represent one of the most globally important deposits in the Devonian, have gained little attention regarding their genesis and diagenetic evolution. This study focuses mainly on the post-depositional changes that occurred during shallow to deep burial diagenetic evolution and subaerial weathering of the Geirud phosphorites. The phosphorites consist of phosphatic massive mudclasts, detritus-rich lithoclasts, bioclasts and bones formed by several stages of phosphogenesis and erosion, reworking, winnowing and condensation associated with Famennian sea level changes. The phosphatic clasts consist of early diagenetic, poorly crystalline, carbonate fluorapatite (CFA) and pyrite cementing detrital quartz, illite, muscovite, rutile and zircon. Phosphatic clasts are intensely compacted with sutured grain contacts, along which dissolution and reprecipitation of chemically-refined, well crystalline CFA with a bright blue cathodoluminescence and illite occurred during deep burial diagenesis. Similarly, quartz shows deformation planar features; overgrowth cement was developed as a result of pressure dissolution in phosphatic sandstones, followed by precipitation of ferroan dolomite, ankerite and chlorite in secondary porosity. Subaerial weathering led to oxidation of pyrite and generation of acidic pH condition, under which Ca and P from phosphates, Fe and S