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1 Origin of autigenic phosphates in siliciclastic and carbonate rocks

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Phosphates and REE in Archean metasedimentary rocks (Isua, Groenland) have been controversely debated being a potential biomarker (1,2,3). Here, three different sedimentary environments were studied for phosphate autigenesis in the Central Moroccan basin in order to contribute to the understanding of phosphate origin, formational processes and their evolution during diagenesis: (1) Paleodeltaic schists and sandstones containing tempestitic calcareous sandstone lenses and microbialites (Viséan-Serpukhovian); (2) Shallow platform calcareous sandstones, bioclastic limestones (Viséan); (3) Deep basinal calcareous sandstones containing limestone nodules and bioclastic limestones (Devonian). The REE patterns of the siliciclastic facies reflect the detrital input of xenotime, monazite and apatite, which occur also as inclusions in biotites and quartz. Early diagenetic reducing, locally oxygenic and alkaline fluids liberated and partly dissolved these phosphates. During organic matter decay additional P was released to the pore fluids. Diagenetic anhedral apatites, monazites, xenotimes ($\sim$200 μm) and florencite formed contemporaneously with quartz and calcite, and englobe detrital albite and biotite. HREE hosting xenotimes included in large LREE bearing apatites contain U$<$Th, whereas phosphates in the claymatrix are characterized by U$>$Th. Micrometric monazite and Ca-phosphate spherules in the prodeltaic and deep basinal calcareous sandstones, probably related to microbial activity recrys-

tallized to euhedral abiogenic apatite, having still preserved the sperulitic internal texture.

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