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Barite cohesive layers formed on gypsum surface by a pseudomorphic replacement

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Mineral replacement reactions are critical in most geochemical processes, including diagenesis, the redistribution of elements in the Earth's crust and hence the formation of secondary mineral and ore deposits. When a mineral surface is in contact with an aqueous fluid, replacement reactions may occur via interface-coupled dissolution-precipitation, resulting in the formation of a new phase. In these processes, dissolution of the parent phase occurs and consequently the solution at the mineral-fluid interface becomes supersaturated with respect to a new mineral phase that can nucleate at the surface of the parent mineral. In the present study, we provide experimental evidence suggesting that during the interaction of gypsum ($CaSO4*2H_2O$) cleavage surfaces with Ba-bearing solutions, gypsum is pseudomorphically replaced by barite (BaSO4). A homogenous micron-sized layer of barite formed on gypsum cleavage surfaces within some hours of exposure to Ba-bearing solutions. This occurs most likely via an interface-coupled dissolution-precipitation mechanism. Interestingly, our observations show a certain degree of crystallographic control on the product layer by the structure of the parent substrate. This pseudomorphic replacement of gypsum by barite could be used as a conservation procedure for gypsum sculptures and plasterworks, increasing their resistance against water and humidity while preserving the surface features of the original mineral substrate