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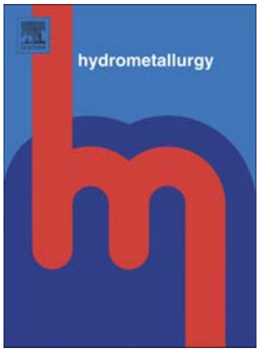

A novel mechanism for the rate of growth during the crystallisation of salts and the precipitation of minerals

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A novel mechanism for the rate of growth during the crystallization of salts and the precipitation of minerals

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Abstract

A kinetic mechanism is proposed for the rate of growth during the crystallization of salts and the precipitation of minerals. This mechanism envisages the deposition of constituent anions and cations onto the surface in separate parallel reactions, each of which is referred to as a 'partial reaction'. The rate of deposition is dependent on the potential difference across the Stern layer. The action of deposition of ions onto the surface both causes this potential and influences the rate of deposition. The resulting rate expression reduces to four limiting cases: (i) equilibrium, (ii) crystallisation far from equilibrium, (iii) "partial equilibrium" due to the cation, and (iv) "partial equilibrium" due to the anion. The proposed mechanism is shown to be widely applicable, with examples from sulphide, carbonate and fluoride systems being discussed. The correspondence between the rate expression for crystallisation and dissolution are clearly delineated for the proposed mechanism. The implications of the mechanism for the interpretation of zeta potential data are discussed.

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