

The interface, unique site where kinetic processes occur

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Interface is a unique site where any kinds of kinetic processes occur, including growth, dissolution, phase transition and interaction between two phases. How these processes proceed is recorded on the interface in various forms. Surface microtopographs of crystal faces offer information relating to the mechanism and process of growth, dissolution, and interaction with impurity component. Internal heterogeneity and imperfection in single crystals are records of interface during growth or dissolution, offering information on morphological evolution and changes of growth parameters. If appropriate methods are applied to visualize these in mineral crystals, either ex-situ or in-situ, large or minute in size, inorganic or biogenic, the kinetic process may be analyzed at an atomic level, offering deeper understanding in the formation of earth and planetary materials, as well as biological-inorganic interaction than that expected from traditional bulk mineralogical investigations and equilibrium thermodynamic analysis.

Both solid-solid and solid-liquid (or vapor) interfaces are our concern. Solid-solid interfaces are characterized by highly dislocated structure, through which diffusion may principally occur or premonitory state of phase transition appears. Solid-liquid (or vapor) interface is the boundary between ordered and disordered phases, where first order phase transition occurs. This interface may be classified into rough and smooth interfaces, depending on which growth and dissolution mechanisms, interaction with impurity components, including protein molecules may be different. Crystal chemical relation between solid and liquid components is different depending on the interface structure.

In the presentation, a historical review will be briefly given how investigation on interfaces, particularly on surface microtopographs of crystal faces were initiated and have been developed in mineralogical community. What sort of information may be obtained in relation to kinetic problems of mineral formation will be explained, and the future direction will be discussed.