Mineral textures as indicators of fluid-driven mineral replacement processes

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The pseudomorphic replacement of one phase by another is characterised by the development of porosity in the product phase. This porosity provides the pathway for mass transport through the parent phase, which is replaced by the product at a moving interface within the mineral during an interface-coupled dissolution-reprecipitation replacement process [3, 4]. Changes in porosity occur as a result of textural equilibration, when a fine porosity may coarsen in an attempt to reduce an internal surface area. Replacement textures commonly occur in relation to fluid-driven regional metamorphism and large scale metasomatism such as the gabbro - to eclogite facies transition, western Norway [1], serpentinization of the oceanic lithosphere, scapolitization of gabbro and albitization of the granitoid rocks from the Bamble area southern Norway [2] as well as albitisation of the mafic rocks of the Curnamona Province, South Australia, suggesting that dissolution-reprecipitation is an important mechanism behind large-scale metamorphic and metasomatic processes. The ultimate result is the mobilization of elements within the earth. Albitization commonly occurs in association with mineral ore deposits, such as the cobalt mines of Modum, the Kongsberg silver mines in Norway and the massive Pb-Zn-Ag mines of Broken Hill Australia. By recognising characteristic replacement textures, it is possible to evaluate the influence of fluid-induced mineral replacement experienced by a particular rock. There are implications for understanding ore deposits as well as isotopic disequilibrium and hence dating and geothermometry.

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Geochemistry of hazardous trace elements in coal from Yanzhou Coalfield

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A total of 21 bench coal samples were collected from Yanzhou Coalfield, China. Pyritic and organic sulfur generally account for the bulk of the sulfur in coal. The distribution and concentration of hazardous trace elements and sulfur in the Yanzhou coalfield are analyzed, and the forms of sulfur are studied. Organic sulfur content was determined by substraction.

The vertical variation of hazardous trace elements and sulfur contents in the coalfield show that all these elements are enriched in the roof and floor rocks of the coal bed and that the concentrations are also relatively high in the clay partings within the coal bed, and Hg and Se have an even higher concentration than that in the world coals. The concentrations of Hg and Se in the seam studied are greater than the global mean of these elements in coals. Se content in the studied coal is 5 times as high as the world coal value and Hg is about one to two orders of magnitude above World Clarke value. Hg is also more enriched compared to the average concentration in Chinese coals.

The concentrations of the trace elements As, Hg and Se are closely related to sulfur. Hg correlates more with pyritic sulfur than organic sulfur. Se relates more to organic sulfur than to pyritic sulfur. As is almost equally related to organic sulfur and pyritic sulfur. Therefore Hg,As and Se may be mainly associated with sulfides and other inorganic matter, also occur in organic forms, especially for Se.