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In situ synchrotron PXRD study of the replacement of bornite under anoxic conditions

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Bornite (Cu5FeS4) is the second most abundant Cu-bearing ore mineral, and is found in a wide range of ore deposits. It is often altered in hydrothermal fluids by mineral replacement reactions, forming complex intergrowth textures with chalcopyrite (CuFeS2), digenite (Cu1.8S), covellite (CuS), and chalcocite (Cu2S). Yet, the mechanism and kinetics of the chemical reactions responsible for the alteration of bornite are still poorly understood. In this work, the hydrothermal mineral replacement of bornite was monitored by synchrotron-based in situ powder X-ray diffraction (PXRD) under anoxic conditions, at the powder diffraction beamline at the Australian Synchrotron. By collecting time-resolved PXRD patterns during the reactions, direct information about the phase evolution was obtained and the fate of transient reaction intermediates was observed. This presentation reports the effects of temperature, solution chemistry, and reaction time on the mechanism and kinetics of bornite alteration. The results suggest that the reaction is faster in chloride-rich fluids, and is generally promoted by increasing temperature and time. The outcomes of this study provide some insights into the mineralization in and around copper deposits.

Speakers Gender

Male

Travel Funding

Yes

Level of Expertise

Student

Do yo wish to take part in the poster slam

Yes

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