Hexagonal CNN and its applications in sphalerite banding texture simulation

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Abstract
Banding textures are commonly observed in mineral crystals for example in sphalerites in Mississippi Valley-type deposit. Cellular Nonlinear Network (CNN) has been developed in the literature for characterizing complexity especially for reaction-diffusion dynamic systems. These include models describing periodic precipitation incorporating nucleation and banding pattern formation in minerals. Based on observation on hexagonal microtexture of the sphalerite in Jingding Pb-Zn large mineral deposit, Yunnan, China, a CNN model in hexagonal coordinate system was developed in this paper to simulate the process for the forming of sphalerite under the presumption that the dynamic procedure begins from the rim of the system inward to the center. The simulated results show that the sphalerite formed has Liesegang band texture and the radii of the crystallites oscillating decrease from the rim of the sphalerite crystal inward forming a big core at the center. The results are in accordance with the observations which demonstrated that the CNN model introduced in this paper is reasonable and can be used to interpret the mechanism for the forming of various textures of sphalerite.

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