MS15-1-12 Crystal structure and thermal behaviour of Bi_6Te_2O15: investigation of synthetic and natural pingguite #MS15-1-12

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Abstract
Pingguite was first reported in 1994 from the Yangjia Au deposit, as $Bi_6Te^{IV}{}_2O_{13}$ [1]. No crystal structure was determinable, and the valence of Te was determined by XPS. Subsequent occurrences of pingguite have been found in 4 additional countries, a more widespread distribution than many secondary tellurium minerals. Around half of the ~90 secondary Te minerals are found only in North America [2]. Despite its low planetary abundance, tellurium is found in an anomalously large number of minerals [3]. This is in part due to its complex chemistry in surface environments, including the stability of two higher oxidation states (Te^{IV} and Te^{VI}) which may coexist [2]. Pingguite is the most recently described mineral containing only bismuth, tellurium and oxygen.
The previously unknown crystal structure of pingguite was determined and refined from laboratory X-ray powder diffraction data using a synthetic sample [4]. We used this structural model to describe additional single crystal diffraction data of natural pingguite. This crystal structure calls for a revised chemistry of the rare mineral pingguite to $Bi_6Te_2O_{15}$ instead of the previously reported formula $Bi_6Te_2O_{13}$. Pingguite contains Te^{VI} only and not Te^{IV} as previously reported. Pingguite undergoes an irreversible phase transition around 840°C which is characterized by a loss of oxygen and a reduction from TeVI to TeIV resulting in a δ-Bi_2O_3 like type structure.

References
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a) Crystal structure and b) picture of pingguite