
**An investigation of the solubility of eskolaite at
supercritical conditions; experimentation with a
Hydrothermal Diamond Anvil Cell (HDAC)**

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The solubility of pure synthetic eskolaite (Cr_2O_3) was investigated in 1 M H_2O_2 aqueous solution via experimentation in a Hydrothermal Diamond Anvil Cell (HDAC) apparatus at supercritical conditions. Crystals synthesized from potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) were characterized with X-Ray Diffraction (XRD), microRaman spectroscopy, and a Scanning Electron Microscope (SEM). A single crystal of eskolaite (volume $\sim 3.25 \times 10^{-4} \text{ m}^3$) and a drop of aqueous solution were loaded into the sample chamber of the HDAC. The density of the solution was determined from the temperature at which the vapour bubble disappeared. All samples were held at temperatures ranging between 500 °C and 650 °C and at pressures between 100 and 300 MPa. The degree of eskolaite

dissolution was visually monitored during the experiment and the crystal was inspected using scanning electron microscopy after hydrothermal treatment. These preliminary experiments provide qualitative data on the behaviour of eskolaite in various aqueous solutions. These results are used for the selection of compositions to be analyzed by in situ spectroscopic methods. Knowledge of the solubility of eskolaite is requisite to understanding its distribution in nature and the interaction of supercritical water with different steel alloys.