

## **Can electron energy-loss spectroscopy (EELS) be used to quantify hydrogen in minerals from the O *K* edge?**

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### **ABSTRACT**

The proposition has been made and is now gaining popular acceptance that electron energy-loss spectroscopy (EELS) attached to a transmission electron microscope (TEM) can be used to semi-quantitatively measure H in minerals—specifically, that there is a pre-peak to the O *K* edge near 530 eV whose intensity is a measure of H concentration in OH- and H<sub>2</sub>O-bearing minerals. I show here that the O *K* edges from H-bearing minerals, free of electron-beam damage, lack a peak near 530 eV. Instead, under electron irradiation in the TEM, a transient peak near 530 eV can form in H-bearing as well as anhydrous minerals. The intensity of the transient peak is dependent on total fluence and fluence rate. The origin of the radiation-induced peak at 530 eV is from O<sub>2</sub> liberated during damage by the incident electron beam. In conclusion, there is no evidence for an OH peak near 530 eV from H-bearing minerals.

**Keywords:** EELS, TEM, beam damage, hydrogen