Chemical & Engineering News
Serving the chemical, life sciences and laboratory worlds

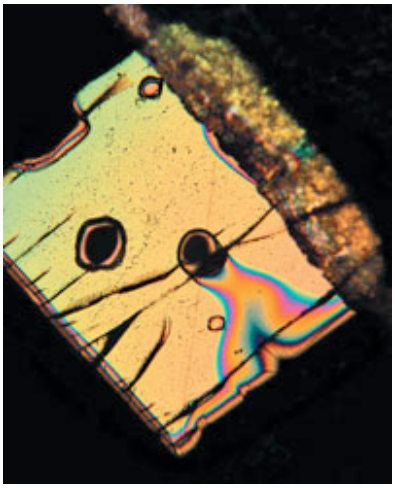
Science & Technology

August 3, 2009
Volume 87, Number 31
p. 28

Answers To Mantle Oxidation Mystery

Spectroscopic study may solve a long-standing debate over what controls the oxidation states of Earth's mantle

Elizabeth K. Wilson



Courtesy of K. Kelley

Under polarized light the glassy melt inclusions trapped in a volcanic olivine crystal appear as dark spots. Image is 1.5 μm across.

A new study of magma samples from areas where tectonic plates collide may help solve a long-standing debate over what controls the oxidation states of Earth's mantle. These oxidizing properties influence the evolution of Earth's crust and mantle. On the basis of data from magma taken from volcanoes just above the mantle wedge that overlays a sinking tectonic plate, scientists concluded years ago that Earth's mantle is more oxidized in areas where tectonic plates are coming together than where they're spreading apart. In this new study, Katherine A. Kelley of the University of Rhode Island and Elizabeth Cottrell of the Smithsonian Institution, in Washington, D.C., used synchrotron-based X-ray absorption spectroscopy to study a variety of volcanic-glass samples from various tectonic areas. They concluded that the iron oxidation state of lavas increases with the amount of water in the sample (*Science* **2009**, *325,* 605). Scientists already knew that water comes from the subducting plate, where one plate slides underneath another. Cottrell tells C&EN that this work now shows that the oxidized signature of the subducting plate, like the water, is also being transferred to the mantle wedge. This implies that the oxidation states of Earth's surface influence those of deep Earth.

Chemical & Engineering News
ISSN 0009-2347