

LETTER

AMORPHOUS MATERIALS: PROPERTIES, STRUCTURE, AND DURABILITY

Competition between two redox states in silicate melts: An in-situ experiment at the Fe *K*-edge and Eu *L*₃-edge†

**MARIA RITA CICONI^{1,*}, DANIEL R. NEUVILLE², ISABELLE TANNOU², FRANÇOIS BAUDELET³,
PAUL FLOURY², ELEONORA PARIS¹ AND GABRIELE GIULI¹**

¹School of Science and Technology-Geology Division, University of Camerino, Via Gentile III da Varano, I-62032 Camerino, Italy

²CNRS-Institut de Physique du Globe de Paris, 1, rue Jussieu, F-75238 Paris, France

³Synchrotron SOLEIL, L'Orme des Merisiers-St. Aubin-BP 48, F-91192 Gif s/Yvette, France

ABSTRACT

The understanding of redox equilibria as well as the knowledge of the elemental distribution in magmatic melts are of fundamental importance to constrain the genesis of magmas. In particular, the partitioning of trace elements (e.g., Eu) has demonstrated to be a useful tool for estimating the redox conditions in Earth and planetary materials. However, for a more complete comprehension of Eu in silicate melts, information regarding the effects of temperature (*T*), redox conditions, compositions, and the possible interference of other multivalent elements is still lacking. Here we provide new data on the oxidation states of two commonly coexistent multivalent elements (Eu and Fe) in melts, acquired by “in situ” dispersive X-ray absorption spectroscopy experiments at high temperatures and at different oxygen fugacity conditions. This work, for the first time, shows the possibility to monitor in real-time the behavior and valence variations of two elements under varying environmental conditions (like *T* and redox state).

Keywords: Europium, iron, oxidation states, silicate melts, in-situ dispersive XAS