Speciation of commercial CeO2 nanocomposites during aging.

A. Masion[1,2*], L. Scifo[3], P. Chaurand1,[2], M.A. Diot[1,2], J. Labille[1,2], M. Auffan[1,2], J.y. Bottero[1,2] and J. Rose[1,2]

[1]CEREGE, CNRS-Aix Marseille Univ., France. masion@cerege.fr
[2]iCEINT, Aix en Provence, France
[3]Tecnalia, Montpellier, France

In many commercial nanoproducts, nanoparticles are surface modified to obtain new properties and/or to facilitate their dispersion in a matrix. Regular use, aging, and improper handling may cause the release of residues into the environment. As a consequence, assessing the risks associated with a given nanoproduct needs to take into account these residues throughout the entire life cycle of the product.

For example, outdoor wood paint contains CeO_2 nanoparticles as long-term UV-absorber to stabilize paints against degradation. The nanoparticles are citrate coated for better dispersion in the aqueous paint. This work aimed at investigating the transformation occurring at the nanoparticle surface during simulated aging in the lab.

Two sets of experiments were conducted: aging of the Ce based nanocomposite in aqueous suspensions, and aging of a paint containing CeO_2 nanocomposites.

In both cases, the experiments were carried out over several months, with UV/Vis illumination to simulate sunlight, and, in the case the paint samples, included rain cycles at fixed intervals. During the aging, the samples were analyzed in terms of leached Ce content (paint), and physical-chemical properties (size, charge...) and chemical nature of the residues using mainly microscopy and spectroscopy techniques.

Towards a new clinopyroxene geothermometer for alkaline, differentiated magmas

Matteo Masotta[1*], Silvio Mollo[2], Carmela Freda[2], Mario Gaeta[1,2] and Gordon Moore[3]

[1]Sapienza Università di Roma, Rome, Italy
matteo.masotta@uniroma1.it (* presenting author)
[2]Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy
[3]Department of Chemistry and Biochemistry, Arizona State University, USA

In the last decades several clinopyroxene geothermometers have been proposed with the aim to constrain pre-eruptive conditions of volcanic systems [1]. However, the compositional bounds of the calibration dataset represent a serious limitation in their use. In fact, the more the composition of the investigated natural rocks deviates from the compositions in the calibration dataset, the larger the uncertainty in the estimate of temperature will be.

At the present, clinopyroxene geothermometers are mainly calibrated on magma compositions ranging from basalt to rhyolite, leaving poorly constrained or even unconstrained, alkaline differentiated composition. Moreover, the effect of melt-water content on phase compositions is usually neglected. Given the magnitude of the alkaline, explosive volcanism, these two factors cannot be ignored in future calibrations of geothermometers.

In this study, we present a new clinopyroxene geothermometer specifically calibrated for hydrous, alkaline compositions ranging from phonolite to trachyte. This model is based on a broad dataset consisting of 35 phase equilibria experiments, carried out at 200 MPa, in the temperature range 850-1000°C and at variable X_{H2O}-X_{CO2} (H_2O ranging from 0 to 6 wt.% and CO_2 ranging from from 0 to 0.5 wt.%). The equations have been obtained by means of least squares regression analysis of the experimental dataset, yielding a better accuracy of temperature estimate than previous models. Notably, the accuracy of the model largely increases by including the water-melt content parameter in the equations, whereas the presence of CO_2, which actually does not affect the composition of clinopyroxene and melt, scarcely influences the temperature estimate.

[1] Putirka (2008) *Rev. Mineral. Geochem.* **69**, 61-120.