Geophysical Research Abstracts
Vol. 19, EGU2017-9307, 2017
EGU General Assembly 2017

End-Cretaceous akaganéite and its potential as a mineral marker of Deccan volcanism in the global sedimentary record

Eric Font (1), Julie Carlut (2), Céline Rémazeilles (3), Tamsin Mather (4), Anne Nédélec (5), José Mirão (6), and Sandra Casale (7)

(1) Universidade de Lisboa, Faculdade de Ciencias, IDL, Lisbon, Portugal (font_eric@hotmail.com), (2) Institut de Physique du Globe de Paris, Sorbonne Paris cité, Univ. Paris Diderot, UMR 7154 CNRS, Paris cedex 05, France, (3) Laboratoire des Sciences de l'Ingénieur pour l'Environnement, Pôle Sciences et Technologie, Avenue Michel Crépeau, 17042 La Rochelle Cedex 1 – France, (4) Department of Earth Sciences, University of Oxford, Oxford, UK, (5) GET- OMP, Université de Toulouse, France , (6) HERCULES Centre, ECT-Geosciences Department, University of Évora, Évora, Portugal, (7) Sorbonne Universités, Université Pierre et Marie Curie (UPMC), CNRS, UMR 7197, Laboratoire de Réactivité de Surface (LRS), Paris, France

Recently, we identified an enigmatic chlorine-rich iron (oxyhydr)oxide, together with mercury anomalies in End-Cretaceous marine sediments coeval with major eruptions of the Deccan Traps Magmatic Province. The mineral was observed in two remote sections, the Bidart section from the Basque-Cantabric Basin in the Atlantic Ocean, and the Gubbio (Bottacione) section in the Tethys realm, suggesting a global or at least widespread phenomenon. However, the exact nature and origin of this Cl-bearing mineral remained enigmatic. Here we present new results from the Bidart and Zumaya section, in the Basque Cantabric Basin, France and Spain. Micro-Raman analysis, Transmission (TEM) and Scanning (SEM) Electron Microscopy on Focused Ion Beam (FIB) foils were used in order to identify the accurate composition and nanostructure of the chlorine-rich mineral. Our results confirm akaganéite (β-FeOOH) as the main phase, with chlorine content of 3-5% of the total atomic weight. Our high-resolution TEM observations reveal that the micrometric-scale akaganéite particles are constituted by the aggregation of nanoparticles (nanorods) of akaganéite. Their internal structures contain empty spaces, suggesting formation in a low-density environment. Based on this new mineralogical evidence, we propose that the observed akaganéite was formed at low temperature and high altitude in the Deccan volcanic plume and was further transported to Bidart, Zumaya and Gubbio (where presence of akaganeite is inferred based on the similarity of the Cl-bearing minerals to the Bidart material) through the stratosphere. Therefore, akaganéite provides a potential new sedimentary marker to identify the imprint of the Deccan eruptions in the global stratigraphic record and is evidence of the broad distribution of volcanic halogen species at the start of the Cretaceous-Tertiary mass extinction.

Publication supported by FCT- project UID/GEO/50019/2013 - Instituto Dom Luiz