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Raman identification of epidote-group minerals in turbiditic sediments from the Bengal Fan (IODP Exp. 354): a complementary tool to better constrain metamorphic grade of source rocks.

Mara Limonta[1], Sergio Andò[1], Danilo Bersani[2], Christian France-Lanord[3], and Eduardo Garzanti[1]
[1]Laboratory for Provenance Studies, Earth and Environmental Department, University of Milano-Bicocca, Milano, Italy (mara.limonta@unimib.it)
[2]Department of Mathematical, Physical and Computer Sciences, University of Parma, Italy
[3]Centre de Recherches Pétrographiques et Géochimiques (CRPG), CNRS – Université de Lorraine, Vandœuvre-lès-Nancy, France

Together with amphibole and garnet, epidote-group minerals are one of the three most important heavy minerals found in orogenic sediments (Garzanti and Andò, 2007). Their chemical composition and optical properties vary markedly with temperature and pressure conditions, and thus provide useful information in provenance analysis on the metamorphic grade of source rocks.

The aim of this study is to devise an efficient and quick method, with micrometric resolution to distinguish among the different species of the epidote group during routine point-counting of heavy-mineral slides, which can be applied on a vast ranges of grain-sizes from fine silt to medium sand.

The geochemical variability of epidote-supergroup minerals from different source rock collected in different sectors of the Alpine orogenic belt was first investigated by coupling Raman Spectroscopy, Scanning Electron Microscopy, and Energy-dispersed X-ray Spectroscopy (SEM-EDS). The geochemical composition, optical properties, and Raman fingerprints of these standard epidote grains were described and in-house database of Raman spectra was created, combining geochemical data and Raman response in the low wavenumbers region and OH stretching bands. A program, written in Matlab® language, has been established which allows to obtain a quick estimate of the amount of iron from the Raman spectra in the clinozoisite-epidote series.

Raman spectra of detrital epidotes contained in turbiditic sediments of the Bengal Fan (IODP Expedition 354) were next compared with Raman spectra of epidote-group standards to determine their composition. The identification and relative amount of detrital epidote, clinozoisite and zoisite in silt- and sand-sized deep-sea sediments contribute to constrain the metamorphic grade of Himalayan source rocks, reconstruct the erosional evolution of the Himalayan orogen, and provide information on climate change and strengthening of the Indian Ocean monsoon throughout the Neogene and Quaternary.

Key words: epidote, provenance, Himalaya, Raman spectroscopy, Microprobe analyses, optical microscope.

Garzanti, E., Andò S., 2007. Plate tectonics and heavy-mineral suites of modern sands. In: Mange, M.A., Wright, D.T. (Eds.), Heavy Minerals in Use, Developments in Sedimentology Series, 58. Elsevier, Amsterdam, pp. 741-763.