Clinozoisite-epidote series discriminated by Raman spectroscopy: An application to Bengal Fan turbidites (IODP Expedition 354)

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Supplementary Material File S1 – Epidote standards

Table S1. Information of the nine standards of epidote-group minerals. Names, labels, localities, and source rocks are indicated (SA, mineral collection of Sergio Andò).

Table S2. Chemical composition for all points analysed by SEM-EDS on the nine standards of epidote-group minerals. % Ep = Fe^{3+}/ (Fe^{3+} + Al + Cr^{3+} - 2); % Czo = (Al – 2) / (Fe^{3+} + Al + Cr^{3+} - 2); X_{Fe} = Fe^{3+}/ (Fe^{3+} + Al). Formulas from [26,47].

Table S3. Diagnostic Raman peaks of the six epidote and clinozoisite standards (same points analysed by SEM-EDS); ν = main vibrational mode; X_{Fe} = Fe^{3+}/ (Fe^{3+} + Al).

Supplementary Material File S2 – Epidotes Bengal

Table S4. Key information on the studied cores drilled during IODP Expedition 354 to the Bengal Fan (time scale after [57]).

Table S5. Sample information. Full sample identifiers are provided in standard IODP notation and shorter labels used in text and tables. Core depth in metres below sea floor. Grain size determined by wet sieving. Age after [57].

Table S6. Heavy-mineral data. HMC and tHMC = heavy-mineral and transparent-heavy-mineral concentration; n.d. = not determined. The ZTR index (sum of zircon, tourmaline, and rutile over total transparent heavy minerals; [61]) evaluates the durability of the detrital assemblage [60]. The Metasedimentary Minerals Index MMI and the Amphibole Color Index ACI vary from 0 in detritus from low-grade to lowermost medium-grade rocks yielding exclusively chloritoid and blue/green amphibole to 100 in detritus from granulite-facies or volcanic rocks yielding exclusively sillimanite and brown

hornblende or oxy-hornblende and are used to estimate the average metamorphic grade of source rocks and provenance of amphibole grains, respectively [59].

Table S7. Compositional variability of epidote-group minerals in 41 samples of Bengal Fan turbidites ranging in grain size from fine silt to medium sand. GSZ, grain size; n°, number of analysed grains; tHM, transparent heavy-minerals, EpGM, epidote-group minerals, Ep, epidote, Czo, clinozoisite, Zo, zoisite, Aln, allanite, RF Ep, epidote-bearing rock fragments.

Table S8. Raman peaks in the high-frequency OH region for each studied epidote and clinozoisite grain in Bengal Fan turbidites from core U1454 and corresponding X_{Fe} value estimated by the new MATLAB™ program *epidotefull***.**

Table S9. Raman peaks in the high-frequency OH region for each studied epidote and clinozoisite grain in Bengal Fan turbidites from core U1453 and corresponding X_{Fe} value estimated by the new MATLAB™ program *epidotefull***.**

Table S10. Raman peaks in the high-frequency OH region for each studied epidote and clinozoisite grain in Bengal Fan turbidites from core U1452 and corresponding X_{Fe} value estimated by the new MATLAB™ program *epidotefull***.**

Table S11. Raman peaks in the high-frequency OH region for each studied epidote and clinozoisite grain in Bengal Fan turbidites from core U1449 and corresponding X_{Fe} value estimated by the new MATLAB™ program *epidotefull***.**

Table S12. Raman peaks in the high-frequency OH region for each studied epidote and clinozoisite grain in Bengal Fan turbidites from core U1451 and corresponding X_{Fe} value estimated by the new MATLAB™ program *epidotefull***.**

Supplementary Material File S3

File S3. Full description of "*epidotefull"* MATLAB™ program.

Figure S1. Spectral deconvolution in the OH stretching region of epidote standard E4. A single Gauss-

Lorentzian peak was used for each peak, despite its slight asymmetry, to identify a unique band position for the calculation of XFe values based on Raman spectra with the MATLAB™ routine "*epidotefull"*. The calculations are based on all four main Raman peaks (υ1, υ2, υ3, and υ_4).

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