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Insights into the fine-grained fraction of serpentine mud from the Southern Chamorro seamount (ODP Leg 195): A combined XRD, RFA and TEM-EDS study

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Serpentine mud volcanoes in the outer forearc of the Izu-Bonin-Mariana subduction system occur in a restricted zone, 50km – 120 km away from the trench axis [Fryer et al., 1985]. The morphotectonic elements of the forearc are dominated by horst and graben structures, caused by extensional movements and normal fault systems related to seamount subduction [Fryer et al., 2000; Stern and Smooth, 1998]. These faults may provide conduits for the diapiric uprising of low density serpentine, extruding at the seafloor in stratovolcanic like structures. Released fluids from the subducted slab at estimated depths of approximately 30km are considered to hydrate the forearc mantle wedge along those fractures [Benton et al., 2001; Mottl et al., 2003; Rübke et al., 2004]. During the formation of the fault gouge, serpentine-bodies entrained xenoliths and xenocrysts from the surrounding rocks and are exhumed towards the surface [Fryer et al., 1990]. In our investigation we focus on the silty to clay-sized particle fraction of the serpentine mud matrix, drilled during ODP Leg 195 at site 1200E. We analysed the bulk mineral composition with X-ray diffraction methods on random powder samples, supplemented by X-ray fluorescence measurements on 25 samples. To obtain more insights into the mineralogy fabric and microstructure of the samples, electron microscopy and electron dispersive spectroscopy were used to determine the crystal-chemistry and alteration textures. Particular emphasis was given on determining serpentine polymorphs and the nature of other phyllosilicates and their geochemical composition and constraints. Geochemical observation of the secondary mineral phases should allow us to reconstruct the processes linked with the migration of fluids and volatile components during subduction related metamorphism affecting the mantle wedge. Based on the new data we characterize the conditions of alteration products within a subduction factory, related to the diapiric deposition of serpentine mud volcanoes.

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