



*Supplement of*

## **Magnesium isotope fractionation processes during seafloor serpentization and implications for serpentinite subduction**

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## 1. Thin section descriptions of six of the samples used for partial digestion experiments

82-558Z-42R-1W, 133-135 cm): Completely serpentinized and slightly deformed harzburgite with relict Cr-spinel. Olivine is altered to serpentine and magnetite in mesh texture. Some meshes show a brown stain. Pyroxene is altered to serpentine and locally minor chlorite. Sample experienced brittle deformation subsequent to serpentinization. Completely serpentinized non-pseudomorphic patches are locally abundant. Several generations of serpentine, serpentine-magnetite, and serpentine-iowaite veins cut this sample.

82-558Z-48R-1W, 45-46 cm): Completely serpentinized harzburgite with relict Cr-spinel, partially altered to ferrichromite. Olivine is replaced by serpentine and magnetite in mesh texture. Pyroxene is replaced by serpentine or serpentine and chlorite in bastite texture. Several generations serpentine and serpentine-magnetite veins cut mesh and bastite textures. The latest generation consists of iowaite veins that cut all previous vein generations.

125-779A-10R-2W, 51-53): Strongly serpentinized harzburgite with relict olivine, orthopyroxene, and spinel. Olivine is altered to serpentine and brucite plus minor iowaite in mesh texture. Micrometer-sized opaques including magnetite, Ni-Fe alloys, and sulfides are locally abundant in mesh texture. Orthopyroxene is altered to serpentine in bastite texture. Spinel appears unaltered. Chlorite-serpentine and serpentine-brucite veins cut the sample.

153-920B-12R-2W, 140-143): Completely serpentinized dunite with abundant Cr-spinel. Olivine is altered to serpentine and brucite and minor iowaite in mesh texture. Spinel is partially to completely altered to ferrichromite and locally chlorite. Several generations of chlorite, serpentine, and serpentine-magnetite veins cut the sample. Some veins contain abundant magnetite.

195-1200A-11R1 47-49): Completely serpentinized harzburgite. Olivine is altered to serpentine, minor brucite, and magnetite in mesh texture which has a dark coloration. Orthopyroxene is altered to serpentine and minor chlorite. Spinel is locally altered to ferrichromite. Abundant chrysotile veins cut the sample.

195-1200A-17G 76-79): Partially serpentinized harzburgite. Olivine is altered to serpentine and brucite, and traces of magnetite in mesh texture. Some of the brucite is altered to iowaite. Orthopyroxene is completely altered to serpentine. Clinopyroxene associated with spinel is unaltered. Spinel is locally altered to ferrichromite. Several generations of serpentine and serpentine-brucite veins can be recognized. A large chrysotile vein with a brown halo composed of serpentine, brucite, and iowaite cuts the sample.

### Figure S1: Diagrams of TGA analyses for 8 of the partially digested serpentinites

Each panel shows the TGA analysis of the unleached serpentinite in dashed line and the TGA analysis of the post-leach residue. It can be seen that the mass loss occurring at ~250-400°C for the unleached serpentinites has been essentially fully removed by the partial digestion procedure.

