Carbonate Precipitation Induced by Serpentinization on the Mid-Atlantic Ridge

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Serpentinization of peridotites on mid-ocean ridges leads to the formation of carbonate minerals. It is the aim of this project to reconstruct the genesis of these carbonates and to understand the factors triggering their precipitation. For comparison and to widen the significance of our work, we not only study serpentinite-hosted carbonates from the Logatchev hydrothermal field of the Mid-Atlantic Ridge (MAR), but also included in this study secondary carbonates hosted in sulphide rock and in jasper from the Logatchev field, as well as serpentinite-hosted carbonates from the northern Atlantic Gakkel ridge; another slow spreading ridge typified by ultramafic rocks. The dominant carbonate minerals are aragonite and calcite, but a previously not reported variety of dolomite was found as well. A number of aragonite and calcite phases are found including microcrystalline cements as well as different crystal aggregates of fibrous cements. The conditions during formation of these phases have been confined by carbon and oxygen stable isotopes and some preliminary REE data (see progress report). To further constrain these conditions, we plan to (1) produce more REE data, (2) determine the exact mineralogy of accessory secondary minerals with an electron microprobe, and (3) analyse Sr and Li isotope patterns of secondary carbonates. Although we found little evidence for a biotic origin of the carbonate phases studied, a peculiar network of filaments enclosed in aragonite cement is interpreted to represent a fossilized microorganism (see progress report). This network is awaiting analysis with an electron microprobe. Finally it will be tested if REE patterns – negative Ce anomalies in particular – may serve as a new proxy to verify biogenicity of authigenic carbonate phases. For this test, the MAR carbonates will be compared with modern marine carbonates with an established microbial origin.