ROCK MAGNETIC CHARACTERIZATION THROUGH AN INTACT SEQUENCE OF OCEANIC CRUST, IODP HOLE 1256 AND COMPARISON WITH DSDP 504 B

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One goal of drilling a complete oceanic crust section is to determine the source of marine magnetic anomalies. For crust generated by fast seafloor spreading, is the signal dominated by the upper extrusive layer, do the sheeted dikes play a role, what role do the gabbros play relative to slow spreading centers, and what is the timing of acquisition of the magnetization? To address these questions, we are conducting a comprehensive set of rock magnetic, paleomagnetic measurements and microscopic studies that extend through the intervals drilled on Leg 206 and Expeditions 309 and 312. Recent drilling in the Eastern Pacific Ocean in Hole 1256D reached gabbro within seismic layer 2, 1157 meters into crust formed at a superfast spreading rate (i.e. up to 200mm/year full rate) on the Cocos-Pacific plate boundary between 19 and 12 million years ago. Sampling an intact sequence of oceanic crust through lavas, dikes, and gabbros is necessary to advance the understanding of the formation and evolution of crust formed at mid-ocean ridges, but it has been an elusive goal of scientific ocean drilling for decades. Continuous downhole variations in magnetic grain size, coercivity, mass-normalized susceptibility, Curie temperatures, and composition have been mapped. Compositionally, we have found that the iron oxides vary from being titanium-rich (TM60) to titanium-poor magnetite as determined semi-quantitatively from Curie temperature analyses. Magnetic grain sizes vary from few Single Domain (SD), to the majority of them being Pseudo Single Domain (PSD) and some on the Multi Domain (MD) area of the Day diagram. The low-Ti magnetite or stoichiometric magnetite is present mainly in the lowest part of the section and is associated with higher Curie temperatures (550Â°C to near 580Â°C) and higher coercivities than in the extrusive basalts. Skeletal titanomagnetites with varying degrees of alteration is the most common magnetic mineral throughout the section and is often bordered by large iron sulfide grains. Last but not least, absolute paleointensity experiments have been determined on several samples, although the success rate is low as has been found in other studies of oceanic basalts. We also compare our rock magnetic results with the results obtained from DSDP hole 504B to have a better characterization of the rock magnetic properties of the two sampling sites within the Cocos Plate (~15 Ma) and Nazca Plates (~5.9 Ma) respectively.

Rock magnetism, Basalts, Gabbros

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