古始生代花崗岩に含まれる離溶磁鉄鉱の岩石磁気と古地磁気

臼井 洋一 [1]; 渋谷 岳造 [1]; 澤木 佑介 [2]; 小宮 剛 [3]; 谷 健一郎 [4]; 西澤 学 [1]; 斎藤 誠史 [1]; 柏原 輝彦 [1]
[1] 海洋研究開発機構; [2] 東工大・地惑; [3] 東大; [4] 科博

Rock magnetism and paleomagnetism of tiny exsolved magnetite in plagioclase from a Paleoarchean granitoid in the Pilbara craton

Yoichi Usui[1]; Takazo Shibuya[1]; Yusuke Sawaki[2]; Tsuyoshi Komiya[3]; Kenichiro Tani[4]; Manabu Nishizawa[1]; Masafumi Saitoh[1]; Teruhiko Kashiwabara[1]
[1] JAMSTEC; [2] TiTech; [3] The University of Tokyo; [4] National Museum of Nature and Science

Granitoids are widespread in Precambrian terranes as well as the Phanerozoic orogenic belts, but they have garnered little attention in paleomagnetic studies, because granitoids often contain abundant coarse-grained, magnetically unstable oxides. We have reported the first example of tiny, needle-shaped, exsolved oxides in plagioclase in a Paleoarchean granitoid in the Mount Edgar Complex, Western Australia. The magnetic properties of single plagioclase crystals with the exsolved oxide inclusions have been studied to determine their paleomagnetic recording fidelity. Demagnetization experiments and hysteresis parameters indicate that the oxide inclusions are near stoichiometric magnetite and magnetically very stable. First-order reversal curve (FORC) diagrams reveal negligible magnetostatic interactions. Minimal interactions are also reflected by very efficient acquisition of anhysteretic remanent magnetization. Single plagioclase crystals exhibit strong magnetic remanence anisotropies, which require corrections to their paleodirectional and paleointensity data. Nonetheless, quantitative consideration of anisotropy tensors of the single plagioclase crystals indicates that the bias can be mitigated by properly averaging data from a few tens of single crystals. From the nonlinear thermoremanence acquisition of the plagioclase crystals, we estimate that the plagioclase crystals can reconstruct paleointensity up to 50 micro-T. Local metamorphic condition suggests that those magnetites may carry remanence of 3.2 to 3.3 Ga. We will also discuss the preliminary paleomagnetic data from the Mount Edgar Complex.

花崗岩は顕生代に限らず先カンブリア系のテレーンにも広く分布している。しかし、花崗岩は多くの場合粗粒な磁鉄鉱を含むため、古地磁気の対象としてはあまり用いられてこなかった。我々はピルバラ地塊の古始生代の花崗岩（Mount Edgar 複合岩体）中の斜長石が、単磁区サイズの離溶磁鉄鉱を含むことを発見した。斜長石単結晶の岩石磁気分析から、これらの磁鉄鉱は古始生代の地磁気記録を保持し得ることがわかった。磁気異方性と熱残留磁化の飽和について検討した結果、数十個の斜長石を平均することで、古地磁気方位は正確に復元でき、古地磁気強度も約 50 micro-T までは正確に復元できることがわかった。発表ではさらに、予察的な古地磁気分析結果について報告する。