Eliminating spurious magnetic phases of sedimentary rocks using reductive chemical treatments –A thermomagnetic experiment study on the Upper Cretaceous Yezo Group-

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Sedimentary rocks often have secondary components of chemical remanent magnetizations (CRM) during post-depositional processes, lithification, diagenesis, and/or later chemical events, in addition to the primary detrital remanent magnetization (DRM). These secondary components are carried by secondarily formed minerals of iron-oxides, hydroxides, and/or sulfides. These secondary minerals are produced by Fe-ions contained in pore water and/or sedimentary rocks itself. Therefore, secondary CRM carriers precipitate in the space between mineral particles and/or the voids of the sedimentary rocks, since these parts are reached first by pore water from outside of the samples. The secondary minerals often have a large thermal alteration during thermal demagnetization experiments. Thermal alterations at high temperature steps often introduce large laboratory-CRM, which masks the primary component. Those CRM acquired in the furnace could be reduced by removing secondary magnetic minerals using reductive chemical demagnetization (RCD) beforehand (Anai et al., 2018). In this study, we show the results of rock magnetic and paleomagnetic experiments of samples from the Upper Cretaceous Yezo Group, in order to see whether the RCD is effective reducing such spurious magnetic components.
A pair of chip samples were prepared from paleomagnetic cores. One of the chip samples was subjected to RCD, and the other remained intact. The RCD is performed by dipping the chip sample in the etchant for 72 hours (recipe: Ascorbic acid 5%, buffered by sodium bicarbonate, and adjusted to pH= ~5.6, ORP= -150 to -50 mv). Strong-field thermomagnetic analyses were conducted on both chip samples with and without the RCD. Thermomagnetic curve of the samples without RCD show 4 types of thermal alternation behavior. As a characteristic example of the result Type-C is as follows: magnetization (Js) increases around 400˚C. The increase of Js makes a peak at 450˚C and then Js gradually decreases to zero at 580˚C. Abrupt increases of Js around 450˚C was not observed for the RCD sample, while the Js drops at 150˚C and 580˚C are the same as those observed for the samples without RCD. These results suggest that the iron-containing minerals, which changed to minerals carrying CRM around 450˚C, had been effectively removed by RCD. The results suggested that the RCD pretreatment may suppress thermal alteration of sedimentary rocks. This approach seems to have potential for reducing spurious secondary magnetic components effectively, though the relation between the thermal alteration and spurious magnetic components is not well understood.

Keywords: Yezo Group, Reductive chemical demagnetization

