MAGNETIC PROPERTIES OF DIABASE SILLS OF AGARDHDALEN, EAST CENTRAL SPITSBERGEN, SVALBARD ARCHIPELAGO

by

Kamran Aiinehsazian, B.S.

A Digest Presented to the Faculty of the Graduate School of Saint Louis University in Partial Fulfillment of the Requirements for the Degree of Master of Science (Research)

1981

DIGEST

Paleomagnetic studies of diabase sills outcropping near Agardhdalan in East Central Spitsbergen have been in progress for several years. One of the usual conditions for the validity of paleomagnetic data and deductions drawn from such data is the assumption that the natural remanence investigated is of primary origin, dating back to the time of formation of the relevant rock units. This necessitates knowledge of the magnetic properties of the rock units and the origin of their magnetization. The objectives of this thesis have been to study the magnetic properties of the diabases, identify the magnetic minerals present and ascertain the origin of their natural remanent magnetization. The material for study was derived from two diabase sills sampled in five distinct localities. The laboratory investigations consisted of measurements of natural remanence, isothermal remanence and thermoremanence and the stability of these against alternating field and thermal demagnetization. In addition, microscopic studies using reflected and transmitted light were conducted to identify the magnetic minerals and the degree of alteration to which they may have been subjected.

The results of these investigations showed that

the main magnetic constituents in the diabases were generally titanium-poor titanomagnetites with a wide range of grain sizes corresponding to single domain, psuedo-single domain and multidomain magnetic material. The single domain material was found to carry natural remanence which was of thermoremanent origin. Except in one locality, where primary natural remanence was found to be overprinted with stable secondary magnetizations, the natural remanence in the other localities was relatively stable though the secondary overprints were unstable.

In addition to the titanium-poor titanomagnetite, other magnetic phases were found in the diabases related to the processes of deuteric and low-temperature oxidation. The rock material investigated was divided into three groups according to the degree of low-temperature oxidation related to the extent of regional hydrothermal alteration. Group 1 comprised material with an insignificant low-temperature oxidation (Localities I, II and III), group 2 (Locality V) contained material with small to medium low-temperature oxidation, whereas in group 3 (Locality IV) the degree of low-temperature oxidation was relatively high. Microscopic studies of samples heated in the laboratory to about 600°C showed that a fine grained magnetic material was generated from non-magnetic iron silicates, accompanied by loss of iron

from magnetic opaques. The overall conclusion was that the observed magnetic properties of the diabase sills validate the results of paleomagnetic studies.