

Composition of volcanic rocks dredged from the Alpha Ridge, Arctic Ocean

Williamson, M.-C., Oakey, G.N., Hamilton, P.B., Jackson, S.E., Lawley, C.J.M., MacDonald, D.J., Kellett, D., Weis, D., Carey, R.J., Wilton, D.H.C., Petts, D.C., Massey, E.A., & Harris, J.R.

Marie-Claude.Williamson@canada.ca

In August 2016, a collaborative Canada-Sweden Polar Expedition under Canada's ECS-UNCLOS Program dredged approximately 100 kg of volcanic rocks from the Alpha Ridge. The samples consist of volcanic breccia, carbonate rocks, and a single fragment of fossilized plant material. Here, we report the results of laboratory studies on the sample of volcanic breccia.

The lapilli tuff consists of vitric lapilli clasts, angular lithic clasts of fine-grained, sparsely porphyritic basaltic lava, relict crystals of feldspar and olivine pseudomorphs. Vesicles are flattened and lined with zeolites. The vitric fragments consist of sideromelane glass overprinted by abundant plagioclase microlites. Texturally, these lapilli display a fresh glassy core surrounded by Fe- and Ti-rich zones and a palagonite rim. Major and trace element analyses of glassy cores indicate remarkably uniform, mildly alkaline basaltic compositions. Together with the dominance of glassy vitric clasts in the tuff, this feature suggests a primary eruption-fed origin during a single volcanic event. In contrast, angular clasts of basaltic lava show distinctive geochemical signatures indicating a cognate origin.

Detailed work on the volcanic glass confirms that it is suitable for isotopic studies, $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology and an analysis of glass volatiles. To our knowledge, the size and pristine state of the dredged sample are unique, allowing our team to carry out the first comprehensive study of a single eruptive event preserved in the volcanic record of the Alpha Ridge.