MICROBIAL INTERACTIONS IN THE ALTERATION PROCESSES OF NATURAL BASALTIC GLASS: TEXTURAL EVIDENCES IN PILLOW BASALTS FROM THE EASTERN FLANK OF THE JUAN DE FUCA RIDGE

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Many recent studies have shown the importance of microbial interaction in the alteration processes of natural basaltic glass (FISK et al., 1998; FURNES & STAUDIGEL, 1999). This interaction may be direct, through release of specific enzimes, or indirect, through chemical action of their metabolic products, through the immobilization of specific substances on their cell surface, or through modification of pH and Eh conditions of the environment (THORSETH et al., 1992). Pillow basalts (0.8 to 3.5 Ma old), with glass rims up to 5 mm thick, were recovered during ODP Leg 168 from nine sites drilled across the eastern flank of the Juan de Fuca Ridge (from about 20 km to roughly 100 km east of the ridge axis). The glassy rims show variable degree of palagonitization which increases regularly with the age of the oceanic crust. The degree and the style of the glass alteration are strictly related to the presence of concentric and radial cracks and veins (generally < 0.5 mm wide). Most of the cracks and veins are characterized by the presence of palagonite rinds, often showing different altered zones. Microscopic textures suggestive of a microbiological origin have been found adjacent to hair-sized fractures and clay-filled veins and vesicles in some samples from the oldest sites (2.6–3.5 Ma). The most common features are elongated channels, up to 5 μm in diameter, which occur along fractures or clay veins and extend for several tens of micrometers into unaltered glass. Most channels taper down in diameter and are irregular and frequently convoluted. Some channels bifurcate into two or more branches and are commonly characterized by distinctly segmented or septate textures. Other channels may contain one or more small spherical balls with a diameter that fills the channel, usually at a bend or near the tip. Other features that might be related to microbial alteration include isolated hemispherical patches of alteration that occur along fractures in glass, and coarse optically fuzzy protrusions, tens of micrometers across and slightly elongated, that extend from clay-filled vesicles into fresh glass. Features very similar to all of these have been explained as a result of bacterial activity on alteration of glass from a number of subseafloor samples (FISK et al., 1998). Preliminary statistical studies performed with epifluorescence microscopy observations on DAPI (diamidino-2-phenylindole)-stained samples systematically show the presence of DNA within some of the channels and in scattered areas around the hair-sized fractures. Further studies are in progress to confirm the presence of bacterial activity during the alteration of the glassy rims and to clarify the relationship between microbiological and inorganic/hydrothermal palagonitization processes.

References

FISK, M.R., GIOVANNONI, S.J. & THORSETH I.H. (1998). Science, **281**: 978–980.
FURNES, H. & STAUDIGEL, H. (1999). Earth Planet. Sci. Lett., **166**: 97–103.
THORSETH, I.H., FURNES, H. & HELDAL, M. (1992). Geochim. Cosmochim. Acta, **56**: 845–850.