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Dissolution of olivine during natural weathering

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Abstract

Naturally weathered olivine occurring as phenocrysts in Hawaiian volcanic rocks from several volcanic centers and regolith/outcrop settings, and as tectonized olivines from several metadunite bodies in the southern Appalachian Blue Ridge, are all similarly corroded by natural weathering. Conical (funnel-shaped) etch pits occur as individual pits, base-to-base pairs of cone-shaped pits, or *en echelon* arrays. Etch-pit shapes and orientations in the smallest etch-pit arrays visible in conventional scanning electron microscopy resemble even smaller features previously reported from transmission electron microscope investigations of olivine weathering. Etch pits occur in samples with chemical and/or mineralogical evidence of weathering, and/or are associated with, or proximal or directly connected to, fractures or exposed outcrop surface, and therefore are formed by weathering and not inherited from pre-weathering aqueous alteration (e.g., serpentinization, iddingsitization) of these parent rocks. Many etch pits are devoid of weathering products. Natural weathering of olivine is surface-reaction-limited.

Similarity of corrosion forms from naturally weathered olivine from multiple igneous and

Similarity of corrosion forms from naturally weathered olivine from multiple igneous and metamorphic parent-rock bodies suggests that olivine weathers in the same manner regardless of its specific crystallization/recrystallization history, eruption/weathering/exposure ages of the olivine's host rock, and the local regolith history.



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