# Evaluation of the Corrosivity of Dust Deposited on Waste Packages at Yucca Mountain, Nevada

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Potentially corrosive brines may form by deliquescence of salt minerals in dust deposited on the surface of waste packages at Yucca Mountain during operations and the pre-closure ventilation period. Evaluation of measured atmospheric and underground dust compositions by thermodynamic modeling and experimental studies of brine deliquescence indicates that brines are likely to form, but will be nitrate-rich and non-corrosive. Processes that modify the brines following deliquescence are beneficial with respect to corrosion. Acid degassing (HCl, $HNO_3$) will potentially dry out brines, but kinetic limitations will limit the effect to increasing the passivity of the brines by raising the pH and increasing the $NO_3$/Cl ratio. Interactions with silicate minerals in the dust buffer brine pH to neutral values, and may also cause dryout.

Predicted dust quantities and maximum deliquescent brine volumes on the waste package surface are small, and physical isolation of salt minerals in the dust may inhibit formation of eutectic brines, further decreasing deliquescence brine volumes. Should corrosive brines form, capillary forces will tend to retain brine in the dust. If brines do contact the WP surface, small droplet or film dimensions do not support development of diffusive gradients and separate anodic-cathodic regions necessary for initiation of localized corrosion. Finally, should localized corrosion initiate, corrosion product buildup will eventually stifle corrosion, by limiting oxygen access to the metal surface, by capillary retention of brine in corrosion product porosity, or by consumption of brine components, principally chloride. Thus, dust deliquescence is of low consequence with respect to repository performance.

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