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### **Effect of Capillary Retention by Dusts on the Corrosivity of Deliquescence Brines**

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#### **Abstract**

The U.S. Department of Energy (DOE) is considering disposing high-level waste in a potential repository at Yucca Mountain, Nevada. Deposition of aerosols and dusts entrained in ventilation air and evaporation of seepage water could lead to the accumulation on the waste package surface of hygroscopic salts, which could deliquesce and form potentially corrosive brines. The salts likely will be mixed with nondeliquescent rock dusts produced during repository construction. The DOE has performed a numerical analysis that indicates rock dusts will retain by capillarity any brine formed by deliquescence, thereby limiting brine contact and potential corrosion of the waste package. To evaluate the effect of capillary retention by dusts on the corrosivity of deliquescence brines, experiments were conducted at 70 °C [158 °F] inside

a controlled humidity chamber using mixtures with varying ratios of NaCl to quartz or rock dust. The relative humidity inside the chamber was increased from a value below to one above the deliquescence point of NaCl, and the corrosivity of the deliquescence brine was monitored by measuring the current using carbon steel multielectrode array sensors. The results indicate that nondeliquescent quartz or rock dust reduced the amount of deliquescence brine that contacted the metal. However, even at a dust-to-NaCl weight ratio of 249, a brine solution still contacted and caused the corrosion of the carbon steel metal surface.

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