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Influence of Aqueous Electrolytes on Electrical Insulating Properties of Polyethylene ADAM TORNHEIM, TOM DEVINE, UC Berkeley — Polyethylene is commonly used as electrical insulation in high voltage (3-35 kV), underground electrical distribution cables. During service conditions the insulation "ages" and may fail. One method of ageing is a consequence of long-time exposure of the polyethylene to humidity and groundwater. Chemical analyses by other researchers indicated iron was frequently detected in degraded areas of aged cable. In the current research we examine the effect of a ferric chloride electrolyte on the electrical insulating character of polyethylene. In earlier research we discovered that in the presence of high DC voltages (approximately 3kV-6kV) ferric chloride electrolytes markedly enhance electron injection into and subsequent electron transport through polyethylene. The present research shows that ferric chloride complexes in solution are likely responsible for electron injection. The effect of exposure to ferric chloride solution was permanent, causing an increase in current density when the polyethylene was subsequently exposed to other electrolytes. The effect of $FeCl_3$ exposure was observed in additive free polyethylene as well as commercially processed polyethylene.

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