Morphological and Compositional Analysis of an Acid Mine Drainage "Kill Zone" Crust

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We present results of morphological and compositional analysis from acidic mine drainage (AMD) derived surface crusts in order to enhance understanding of these soils, increase efficacy of remediation technologies, and to promote site recovery. The study site is an AMD "Kill Zone" near Kylertown, PA. The study site was segregated into two zones based on the presence and thickness of surface iron (oxyhydr)oxide deposits. The red zone encompasses a wet area with saturation from a high water table, thick deposits of iron (oxyhydr)oxides in crusts and abundant algae and mosses. The gray zone refers to a drier area with little or no iron (oxyhydr)oxides. Intact samples of crust microcosms were collected and analyzed using stereoscopy, scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), and X-ray diffraction (XRD). The matrix of red zone samples is predominantly comprised of iron (oxyhydr)oxides and jarosite. A network of thin organic filaments (possibly mycelia) binds particles and aggregates together. Filaments can be seen acting as a bridge between the sample and tiny aggregates. Bassinite and gypsum salt efflorescence, albeit small, is common on pinnacles of crusts. The matrix of gray zone is predominantly composed of layer silicates and likely from exposed subsoil. Air-dry crust from the gray zone is structurally stronger than the red zone. Gray samples exhibit less areal coverage by organic constituents and more pronounced attributes of physical crusting. Organic filaments are present within gray samples. Porosity of both red and gray samples is vesicular and likely inhibits percolation to the subsoil.