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Pilot-Scale Biochemical Reactor Treatability Study for Metals Removal from Mining-Influenced Water

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Abandoned mine drainage (AMD) is a serious problem for many areas of the world, including the United States, where AMD contamination can be found from the hard-rock precious metal mines of the west to the coal mines of the eastern Appalachian mountains. These often acidic discharges typically contain high levels of dissolved metals and sulfate which can exceed drinking water quality standards and cause serious ecological damage to receiving waters. The excessive cost to remediate surface waters impacted by AMD has spurred interest in passive anaerobic treatment technologies, such as vertical flow wetlands, permeable reactive barriers, and biochemical reactors. The challenge in these systems is to select an appropriate substrate that will simultaneously encourage the adsorption and precipitation of metals, nutritionally support the growth of sulfate-reducing bacteria, and exhibit substantial longevity.

A pilot-scale comparative treatability study was conducted to evaluate the ability of four sustainable substrates to reduce the acidity, dissolved metals, and sulfate concentrations in AMD water from the National Tunnel Adit discharge in Black Hawk, Colorado. Ethanol, corn stover/woodchip, woodchip/hay, and crab shell chitin were each evaluated in replicate 30 – 55 gallon drum bioreactors beginning on May 16, 2007. This presentation will highlight the effectiveness of each of the tested substrates in terms of effluent water quality and relative longevity over a period of one year. Parameters to be evaluated include: pH, acidity, alkalinity, sulfate, and dissolved metals concentrations. The results of this collaborative effort will guide the EPA's substrate selection for the construction of a permanent biochemical reactor in the Clear Creek/Central City Superfund Site in north-central Colorado.