Adsorption and dissolution experiments of acid mine drainage from the former Consolidated and Gullbridge mines, Newfoundland and Labrador, Canada

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Acid mine drainage (AMD) is an environmental concern because it produces low pH waters which are contaminated with high concentrations of dissolved metals. We performed adsorption and desorption experiments to investigate natural and potential enhanced remediation of AMD at two abandoned mining sites in central Newfoundland: the former Consolidated Mine and the former Gullbridge Mine. In conjunction with previous work, data obtained through in situ field measurements and laboratory analyses of samples collected at the two sites indicate that these sites are actively leaching AMD into downstream water bodies. Water and sediment samples were obtained from each site for use in a variety of adsorption and dissolution batch experiments.

Laboratory Experiments: Uncontaminated background sediment collected upstream from the Consolidated Mine showed little ability to neutralize pH. The background sediment, however, did substantially reduce copper and lead concentrations. Background sediments collected upstream from the Gullbridge Mine showed a much stronger ability to neutralize pH and reduce copper, zinc and aluminum concentrations. Further batch experiments tested the addition of biofoul (a mixture of mussels and seaweed that accumulates on aquaculture nets) as a method of enhanced AMD remediation. Preliminary results indicate that biofoul has the ability to neutralize pH of AMD taken from each mine, as well as reduce concentrations of some pH- dependent contaminants. The biofoul, however, contained high levels of arsenic and copper which were released into the water. Based on these preliminary results, small quantities of biofoul were chosen for batch dissolution kinetic experiments with the overall goal to partially neutralize pH and limit the levels of copper and arsenic that would be released from the biofoul. Dolomitic lime was added to assist in neutralizing the pH. However, even small quantities of biofoul yielded substantial increases in the copper concentration. Arsenic concentrations remained low throughout the experiments.

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