# Predicting Acid mine Drainage Using Simulated Weathering Experiments: What Further Research Should Address


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Predicting the occurrence of acid mine drainage (AMD) prior to mining is currently achieved through the acid/base accounting method and/or simulated weathering experiments. This study used simulated weathering experiments to quantify the rates and amounts of acidity generated from selected shale and coal samples. The primary goal of the study is to explain why samples with similar sulfur contents produced drastically difference amounts of acidity.

Samples were selected on the basis of their paleoenvironmental setting, sulfur content, and carbonate content. A total of 34 samples were leached under ambient laboratory conditions until declining acidity values were observed. Ten of these samples were found to be devoid of any measurable amounts of carbonate. By holding the carbonate constant, in this case at 0%, the variations in acidity should be explainable by differing sulfur contents and/or a difference in the surface area of the pyrite. It was determined the amount of acidity is correlative with the amount of total sulfur (R= 0.95) in samples devoid of carbonate , however, anomalous acidities were encountered from samples containing pyrite with abnormally high surface areas (Wd 2). Using conventional reflected light microscopy and a scanning electron microscope equipped with a Kevex 8000 energy dispersive x-ray (EDX) and a Lemont image analyser a detailed pyrite characterization revealed that framboidal pyrite is not related to the sulfur content nor could any estimates be made on the surface area of the pyrite as a function on the amount of sulfur that a particular sample contains. A weak relationship does exist (R= 0.73) between the surface area of pyrite and the occurrence of framboidal pyrite. When carbonate is present the effect of these surface area variations are masked. Siderite was the dominant form of carbonate in all of the samples analyzed. It should be noted the small amounts of carbonate, in which the dominant carbonate component was siderite, in samples containing sufficient amounts of sulfur to produce AMD produced little acidity.

The primary shortcomings of predicting AMD is our inability to accurately determine surface area variations in pyrite and our lack of understanding on how variations in the carbonate content (not only amounts but also assemblages) influence the rates and quantities of acid production. These shortcomings are problems in both the simulated weathering experiments and the acid/base accounting method.

Further research needs to address the pyrite reactivity problem (possibly using EGA) and to better differentiate the various carbonate components and attempt to explain how different assemblages of carbonate influence the production of AMD.