THE DEVELOPMENT OF A PREDICTIVE MODEL FOR ACID GENERATION FROM COAL AND COAL ASSOCIATED ROCKS

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The potential of a rock to produce acid or alkaline solutions; the rate at which these solutions are produced and the total production of either acid or base is fundamentally controlled by the composition of the rocks. It has long since then shown that pryite is the producer of the acid; rocks with pyrite produce acid; rocks without pyrite do not. Alkaline solutions are produced from rocks containing carbonate minerals; rocks devoid of carbonate minerals do not produce alkaline solutions. However, it also has been known for some time that the amount of acid or basic solutions produced and their rates of production do not correlate well with the abundance of either pyrite or carbonates except in the most extreme cases. The rate of acid or base production is therefore the result of other rock parameters. Pyrite, for example, exists in a wide variety of morphologies, sizes and even compositions. The carbonates show similar variability. The inherent variability within these materials must in some way affect their chemical reactivity. In addition, one cannot ignore the t that these mineral components do not exist alone but in intimate association with other mineral components of the rock such that the acid or base production potential of the rock is a function of its total composition. To make the situation ever more complex, the rock has additional attributes that affect reactivity such as grain size, porosity, permeability and kind and degree of cementation. In short, to fully understand the chemical reactivity of a rock, the entire system must be known.

Rock samples are being collected which represent all of the rock types associated with coal including partings, seatrocks and overburden. The rock samples will be totally characterized to provide a rock compositional data base. The Development of a Predictive Model for Acid Generation Each sample will then be subjected to controlled leaching; attempting to duplicate the natural leaching of groundwater. The resultant solutions will be thoroughly analyzed to provide a solution data base. The two data sets will then be compared statistically to determine which rock characteristic or combination of characteris tics best explain the chemistry of the resultant solutions.

These data will then be applied to our knowledge of the origin of the rocks associated with coal to form a predictive model which hopefully will allow, with minimum analytical data, a reasonably precise and accurate assessment of the acid/base producing potentials of the rocks encountered in any mining operation. The ultimate goal of these studies is to make the mining of coal more efficient, more profitable and environmentally sound.