Applications of Fractals in the Study of Humic Materials

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A fractal approach seems ideally suited to the study of higher-order structural organization and interactions in humic materials. But in the fifteen years since it has been first applied to their study, there has been surprisingly little interest in applying this tool to advancing the understanding of the unique nature of these ubiquitous materials by any other than those who initially adopted it. However, there have been some basic insights into the fractal nature of humic materials that have come from this early work. This presentation will provide an overview of the application of fractal geometry to the study of humic materials.

Humic materials have been shown to be mass fractal aggregates in solution or in suspension, and surface fractals in the solid state. The fractal dimensions of both fractal types are generally between 2 and 3. But there has been no systematic study of how the fractal dimension varies with environmental variables (pH, ionic strength, humic concentration, sample source, identity and concentration of multivalent cations, aggregate size, etc.).

A basic recognition has emerged that the aggregation of humic material can be described using a fractal approach. Diffusion-limited aggregation is generally operant under acidic conditions, and reaction-limited aggregation becomes more important as the pH increases.

The real value of a fractal approach in the study of humic materials will not be realized until it can be applied in a manner that describes properties, reactions or geochemical behavior for which we previously had no vocabulary, and some possible examples of

such applications will be discussed.