

Geochemical Exploration for Oil and Gas: New Life for an Old Technology

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The application of surface geochemical methods to oil and gas exploration has resulted in varied success and occasional controversy despite recent advances in technology and an improved understanding of migration mechanisms. Few question that hydrocarbons can migrate to the near-surface in amounts that are detectable, but many remain skeptical of how such information is best integrated into exploration and development programs.

The surface expression of hydrocarbon seepage can take many forms, including (1) anomalous hydrocarbon concentrations in sediments; (2) microbiological anomalies; (3) mineralogic changes such as the formation of calcite, pyrite, uranium, elemental sulfur, and magnetic iron oxides and sulfides; (4) bleaching of red beds; (5) clay mineral changes; (6) acoustic and electrochemical anomalies; (7) radiation anomalies; and (8) biogeochemical and geobotanical anomalies. These varied manifestations of seepage have led to the development and marketing of an equally diverse number of surface exploration methods. Each has its proponents; each claims success; and all compete for the explorationists' attention and dollars. Is it any wonder explorationists are confused, or at least skeptical?

Research studies document that hydrocarbon microseepage from oil and gas accumulations is common and widespread, is predominantly vertical, and is dynamic. These characteristics create new applications for geochemical surveys: field development, finding by-passed pay in old fields, and monitoring patterns of hydrocarbon drainage with repeat geochemical surveys. Combined with more established uses of surface geochemistry like high-grading basins, plays, and prospects, these new applications show great promise for the wider and more intelligent use of surface exploration methods.