Geochemical Exploration for Oil and Gas: Advances of the Nineties, Applications for the 21st Century

By

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Detailed geochemical surveys and research studies document that hydrocarbon microseepage from oil and gas accumulations is common and widespread, is predominantly vertical (with obvious exceptions in some geologic settings), and is dynamic (responds quickly to changes in reservoir conditions). These characteristics create a new suite of applications for surface geochemical surveys: field development, reservoir characterization, and monitoring patterns of hydrocarbon drainage. Combined with more established uses of surface geochemistry like high-grading leases, leads, and prospects, these new applications show great promise for the wider use of surface exploration methods in mature basins.

Because hydrocarbon microseepage is nearly vertical, the extent of an anomaly at the surface can approximate the productive limits of the reservoir at depth. Furthermore, the pattern of microseepage over a field can reflect reservoir heterogeneity and distinguish hydrocarbon-charged compartments from drained or uncharged compartments. Additionally, since hydrocarbon microseepage is dynamic, seepage patterns can change rapidly in response to production-induced changes. These applications require close sample spacing and are most effective when results are integrated with subsurface data, especially 3-D seismic data. The need for such integration cannot be overemphasized. Seismic data will remain unsurpassed for imaging trap and reservoir geometry, but only detailed geochemical surveys can image hydrocarbon microseepage from those same reservoirs.

High-resolution microseepage surveys offer a flexible, low-risk and low-cost technology that naturally complements more traditional geologic and seismic methods. Properly integrated with 3-D seismic, their use has led to the addition of new reserves, drilling of fewer dry or marginal wells, and optimization of the number and placement of delineation, development, or secondary recovery wells.