

## **Geochemical Exploration Strategies for the Canadian Arctic**

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### **ABSTRACT**

Geochemical exploration for petroleum is the search for surface or near-surface occurrences of hydrocarbons and their alteration products. The noninvasive, low-impact nature of some of these techniques makes them ideally suited for use in an early-stage evaluation of environmentally sensitive areas such as the Canadian Arctic. Properly designed surveys can quickly identify those parts of the area possessing the highest petroleum potential. Use of such an exploration strategy protects the greater part of the area from more-invasive exploration methods by focusing attention and resources on a relatively small number of high-potential sites.

Geochemical exploration techniques can be direct or indirect, and measurements can be instantaneous or integrative. Direct techniques analyze small quantities of hydrocarbons that occur in the pore space of soil, are adsorbed onto clay minerals, or are incorporated in soil cements. Indirect methods detect seepage-induced changes to soil, sediment, or vegetation.

Onshore hydrocarbon microseepage surveys in the Arctic regions of Canada require careful planning and implementation. Microseepage data are inherently noisy data and require adequate sample density to distinguish between anomalous and background areas. To optimize the recognition of a seepage anomaly, the sampling pattern and sample number must reflect survey objectives, expected size and shape of the target, expected variation in surface measurements, and probable signal-to-noise ratio. Defining background values adequately is an essential part of anomaly recognition and delineation. Undersampling and/or the use of improper sampling techniques is a major cause of ambiguity and leads to interpretation failures.

Geochemical exploration data have found their greatest value when integrated with subsurface geological and geophysical data. Properly applied, the combination of surface and subsurface exploration methods leads to better prospect evaluation and risk assessment.