

Environmental Geochemistry of the lake sediments in vicinity of the Athabasca Oil Sands operations in Alberta, Canada

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Alberta Oil Sand reserves are estimated at 1.7 to 2.5 trillion barrels of heavy hydrocarbon trapped in the complex oil sand mixture, and this constitutes the largest single reserve of oil in the world. Alberta Oil Sand plays major role in economical development of Canada and United States. However, recently the environmental concern over the developments and exploitation of the oil sand resources has come under immense environmental scrutiny. As part of a major environmental assessment research in vicinity of the oil sand operations, this study examines the aerial dispersion of metals, carbon, sulphur, and nitrogen in the lake sediment archives in the surrounding area. The main objective of the study is to fingerprint the spatial impact of the oil sand operations in the surrounding environment, particularly aquatic systems and distinguishing the natural background from anthropogenic input.

Stable isotope geochemistry of C, N, S as well as organic carbon speciation using Rock-Eval analysis was conducted to infer environmental changes throughout the sediment records. Also spatial and tempo-

ral variations of mercury as the most important elements of environmental concern, have been used to investigate the aerial distribution and deposition of this metal in the environment. This study reports the difficulties of using C, N, S stable isotopes in fingerprinting the emissions. It appears that biological activities overprint any possible emission signals. Also biogeochemistry of mercury in relation with distribution of organic matter within the lakes will be discussed.

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