Petrographic and geochemical characteristics of organic matter associated with stream sediments in Trail area British Columbia, Canada

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Abstract

Fifty-six samples of stream sediments from 12 creeks in the vicinity of Trail, British Columbia, Canada were examined to determine their origin, characterize their organic matter and their relation to natural/geogenic and anthropogenic sources. The samples were initially screened by Rock-Eval pyrolysis for their TOC, HI, and OI contents and then examined by both reflected (polarized) and fluorescent light microscopy. It was found that organic matter in stream sediments is mostly from natural/biological sources from local vegetation, such as woody tissue, suberin, spores, and pollen, as well as altered natural/biological input from char formed due to forest fires. Anthropogenic organic matter, mostly coke particles, was also found in the stream sediments. The coke particles have anisotropic properties with medium grained texture formed from medium volatile bituminous coal. The occurrence of coke particles is limited to Ryan Creek located close to an area were some small gold, nickel, and lead smelting operations previously occurred. There is no evidence to indicate that the coke particles found in the creek are emitted from the lead and zinc smelter currently in operation in the area. There are no coal-bearing strata in the area that may have a direct input of coal fragments in any of the creeks.

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1. Introduction

In general, there is very little published data on the total organic carbon concentration and the nature or origin of organic matter in stream sediments. Most of the recent studies on stream sediments are focused on concentrations of elements in urban stream sediments as related to urban pollutants and their possible impact on humans and the global environment as a whole (Sutherland, 2000; Johannesson et al., 2003; Lord and Morgan, 2003; Desenfant et al., 2004). Other studies