Mechanisms controlling plant nitrogen isotope composition

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Scientists routinely measure leaf nitrogen isotope composition and assume it reflects the isotopic composition of the nitrogen source for the plant, allowing investigators to infer inter-specific patterns of nitrogen acquisition. However, results indicate that discrimination will be observed when available nitrogen exceeds plant demand. Significant intra-plant variation in nitrogen isotope composition can also occur because of fractionation within the plant depending on the form of nitrogen absorbed. Stored nitrogen also has a strong affect on leaf nitrogen isotope ratios. Leaf nitrogen isotope ratios may be more a function of physiological, rather than ecological, factors.

The fate of neopentyl-halides in a fractured chalk aquifer

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The aquifer underlying an industrial complex in Israel is heavily contaminated with an enormous variety of organic contaminants, many of which are yet to be identified. This industrial complex hosts for the last three decades several chemical factories and disposal facilities. The contamination is monitored in more than 80 bore-holes sampled annually since 1997. The analysis of the monitoring data reveals that: 1) the most abundant semi-volatile pollutants are the brominated neopentyl alcohols (BNA's); 2) there is a changing pattern in the ratio between different BNA compounds along the flow gradient, e.g. a decrease in the ratio tribromoneopentyl-alcohol /dibromoneopentyl-glycol as a function of distance from the source (factory). The transportation of water and contaminants in this aquifer is almost exclusively via fractures. In these fractures the contaminants are subjected to a variety of processes such as biodegradation, sorption, diffusion to the matrix etc. Differences in the effect of each process on the BNA compounds leave characteristic molecular “signatures”. Based on molecular structure and preliminary experiments the two main processes that can account for the variations observed in the ratio of the two BNA molecules are sorption and chemical decomposition. Experimental work shows chemical transformation of BNA and formation of relatively “stable” products. The specific chemical identity and molecular structure were determined by GC-MS and NMR. These chemicals are present in the aquifer but are not known to occur in any of the industries draining into the system. Our results indicate that these compounds are products of BNA decomposition. The kinetics of these transformations are pH dependent and their activation energy is currently being determined.