Polybrominated diphenyl ethers in the soils of central Tibetan Plateau, China: Distribution, composition and transformation

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The distribution of PBDEs in the mountains of the CTP was determined by sampling soil along an elevation transect. The analysis of soil extracts was performed by gas chromatography and high-resolution mass spectrometry, through which 42 congeners were detected. The samples were also characterized with respect to the soil organic carbon (SOC) and mineral contents. The logarithmic concentration for three of the fractions and the ∑PBDEs increased significantly and exponentially with altitude. The slope value of the linear regression between the logarithm of the clay-normalized three fractional concentrations and the altitude is in the following order: light > intermediate < heavy. The coefficient of determination between the logarithm of normalized concentration and the altitude indicates that in the CTP, the clay normalization exhibits a better correlation to altitude than does the SOC normalization. The exponential equation between the concentration and altitude was modified by accounting for the localized soil properties. The exponential equation between the concentration and altitude was modified by accounting for the localized soil properties.

Clays were found to serve as a catalyst for the debromination of PBDEs in soils. Three pieces of evidence confirmed that the clay was significantly correlated with the debrominating transformation from the higher brominated congeners to the less brominated congeners. The transforming rate was found to be increased 3.5% with a 10% increase in clays. Debromination is an important way for highly brominated congeners to transform into lighter brominated congeners that are more toxic. This study first provided the direct field evidences for clays contributing to the debromination of PBDEs, and elucidated the importance of it in PBDEs environmental fate.