



Soil-adjusted sorption isotherms for arsenic(V) and vanadium(V)

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The sorption characteristic of a soil is usually determined by fitting a sorption isotherm model to laboratory data. However, such sorption isotherms are only valid for the studied soil and cannot be transferred to other soils. For this reason, a soil-adjusted sorption isotherm can be calculated by using the data of several soils. Such soil-adjusted sorption isotherms exist for cationic heavy metals, but are lacking for heavy metal oxyanions. Hence, the aim of this study is to establish soil-adjusted sorption isotherms for the oxyanions arsenate (arsenic(V)) and vanadate (vanadium(V)).

For the laboratory experiment, 119 soils (samples from top- and subsoils) typical for Germany were chosen. The batch experiments were conducted with six concentrations of arsenic(V) and vanadium(V), respectively. By using the laboratory data, sorption isotherms for each soil were derived. Then, the soil-adjusted sorption isotherms were calculated by non-linear regression of the sorption isotherms with additional soil parameters.

The results indicated a correlation between the sorption strength and oxalate-extractable iron, organic carbon, clay, and electrical conductivity for both, arsenic and vanadium. However, organic carbon had a negative regression coefficient. As total organic carbon was correlated with dissolved organic carbon; we attribute this observation to an effect of higher amounts of dissolved organic substances.

We conclude that these soil-adjusted sorption isotherms can be used to assess the potential of soils to adsorb arsenic(V) and vanadium(V) without performing time-consuming sorption experiments.