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A simplified approach for geochemical modelling of complex anthropogenic deposits

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In urban area, wastewater and stormwater management can lead to the formation of sludges or sediments, commonly called surface deposits for infiltration-based systems. These organo-mineral deposits present high organic matter contents. Moreover, they are able to accumulate organic and inorganic pollutants from water. Among them, trace elements (TEs) present risks of release during certain operating conditions, or after dredging. Furthermore, *Banc et al. (2021)* [1] showed that the presence of organic matter in deposits plays an important role in the retention and the remobilization of TEs. In the aim of understanding the governing geochemical processes and the transport of TEs, a geochemical prediction model is an indispensable tool.

A batch leaching test (CENTS/TS 14429 European standard) was used to evaluate the remobilization of TEs from deposits under varying pH conditions (range from 1 to 13). Based on the leaching behavior of the studied matrix during the batch test, *Banc et al. (2021)* [1] developed a multi-surface model. In order to use this model for the simulation of various real scenarios, a simplified approach was developed in the current study. Several complex analyses of the solid matrix, such as ultrafiltration (for the prediction of the humic and fulvic compounds), were replaced by empirical equations. However, a general characterization of the solid matrix and the leached solutions remains indispensable, e.g. total content analysis, XRD, elemental analysis of eluates. The input data for the geochemical model, based on necessary experimental data, which is time and money consuming, is thus, significantly reduced.

In this study, a simplified method by combining elemental analysis and geochemical modelling was able to describe geochemical processes of TEs in the anthropogenic deposits in complexity level by using limited analyzed data. After the validation of approach on other anthropogenic deposits, advances in the TEs' transport modelling become imminent.

[1] Banc, C., Gautier, M., Blanc, D., Lupsea-Toader, M., Marsac, R., Gourdon, R., 2021. Influence of pH on the release of colloidal and dissolved organic matter from vertical flow constructed wetland surface sludge deposits. Chemical Engineering Journal 418, 129353.