Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.8151

Electrokinetic and potentiometric insight into malonate arrangement at hematite/water interface

KAROLINA KEDRA-KROLIK[1], TAJANA BEGOVIĆ[2], MARZENA PRUS[3], DANIJEL NAMIESNIK[2] AND PIOTR ZARZYCKI[4]

[1]Institute of Physical Chemistry PAS
[2]Department of Chemistry, Faculty of Science, University of Zagreb
[3]Institute of Physical Chemistry Polish Academy of Science
[4]Energy Geosciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA

Presenting Author: kkedrakrolik@ichf.edu.pl

The aliphatic low-molecular-weight carboxylic acids, released by plants roots or microbes to the rizosphere, improves the solubility of nutritient cations from soil minerals and rock fragments, and increases their bioavailability [1]. The incorporating of iron in nature and its bio-availability is controlled by adsorption-desorption processes. To understand the role of carboxylic acids in hematite dissolution and reactivity, we need to gain an insight into the nature of pH-dependent iron oxide surface chemistry [2].

By combining measurements of surface and diffuse potential at hematite/water interface with the potentiometric titration of suspension we were able to precisely describe the electrical double layer properties of the hematite/malonic solution interface. We observed that malonate adsorbs in a broad pH range from 3 to 8.3, however, the mode of coordination depends on actual pH value. We distinguished two different types of malonate complexation to the hematite surface: as inner-spherical complexes at pH below 4, and as outer-spherical complexes above pH 5. The transition from the inner to the outer sphere geometries is smooth, suggesting that both types of complexes geometries exist simultaneously, but with a ratio depending on the pH. Our findings are relevant for understanding how organic matter interacts with minerals, a key phenomenon in the chemical weathering processes.

[1] Strobel B.W. (2001) *Geoderma*, **99**, 169-198

[2] Duckworth O.W. et al. (2001) *Geochim. Cosmochim. Acta.* 65 4289-4301