

ζ -potential and pH_{pzc} of digestates from anaerobic fermentation – consequences for soil particle interactions and cation exchange processes in soils with digestate application

Iris Zimmermann, Heiner Fleige, and Rainer Horn

Christian-Albrechts-University Kiel, Institute for plant nutrition and soil science, soil science, Kiel, Germany
(i.zimmermann@soils.uni-kiel.de)

Digestates, a by-product of biogas production via anaerobic fermentation, are often recycled as fertilizer on arable soils. The composition of the digestates is diverse. They can contain plant residues (mainly maize and beet) and manure (mainly cattle, pig and chicken) in variable ratios.

The influence of digestate amendment on soil physical properties has not been widely studied so far. Flocculation or dispersion of the clay fraction influences aggregate formation and thus on soil structure stability. Therefore, the investigation of the influence of digestate amendment on soil particle interactions is of interest. Also, digestates are often referred to as a carrier of cationic nutrients because the fermentation of organic material releases anorganic components into the digestate and the remaining organic particles hold a large specific surface for cation exchange processes.

We measured ζ -potential and pH_{pzc} of digestates (derived from the mono fermentation of wheat, corn and beet, and from the co-fermentation of wheat and beet) with a StabiSizer1 (Particle Metrix GmbH, Meerbusch, Germany). Cation exchange capacity of the organic particles, as well as the concentration of nutrients such as calcium, magnesium and potassium in the liquid portion of the digestates was also measured.

The surveyed digestates have a pH between 7.7 and 8.3. First results of the ζ -potential/pH titration experiments show the high buffering capacity of the digestates with a high stability of both the pH and the surface charge against acid addition. Further research will show how this affects particle interactions and thus soil physical properties in a soil amended with digestates.