

Eu(III)-Fulvic Acid: Size Evolution with pH, metal and FA concentrations by Taylor Dispersion Analysis.

Y.Z. KOUHAIL^{1,2,*}, L. VIO², P.E. REILLER², M.F. BENEDETTI¹

¹Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Univ Paris Diderot, CNRS, F-75005 Paris, France (benedetti@ipgp.fr,

*correspondence: kouhail@ipgp.fr)

²CEA/DEN/DANS/DPC/SEARS/LANIE, Gif-sur-Yvette, France (pascal.reiller@cea.fr, laurent.vio@cea.fr)

Humic substances, one the main component of organic matter in aquatic and soil systems, play an important role in the transport and binding of trace metal elements, such as lanthanides(III). In a former study, we highlighted inter-particulate repulsions between Eu(III)-SRFA complexes at high C_{SRFA} [1]. Such interactions are not yet accounted for within the NICA-Donnan formalism [2]. These inter-particulate repulsions can be due either to modification of the complex size, or to the presence of an electrostatic potential at the interface [3]. The size of the Eu(III)-SRFA complex(es) can be approximated by the hydrodynamic radius (R_H), which can be obtained by Taylor dispersion analysis [4].

Hydrodynamic radii are studied *vs.* C_{SRFA} at pH 4, 6 and 7, for SRFA and for Eu-SRFA complexes with C_{Eu} of 1 and 10 μM . The R_H are comprised between 0.78 and 1.03 nm. There is no significant change in R_H with pH at quite high C_{SRFA} (C_{SRFA} of 500 $\text{mg}_{SRFA}/\text{L}$). At pH 4, we could neither evidence any significant change in R_H values with C_{SRFA} for SRFA particles nor for 1 μM Eu(III)-SRFA complexes. Conversely, at higher pH values a slight, but significant, decrease in R_H values with C_{SRFA} is observed. For $C_{SRFA} < 100 \text{ mg}_{SRFA}/\text{L}$, R_H seem to be higher for pH 6 and 7 than for pH 4. It can be explained by size expansion due to repulsive forces between charged groups with pH. A different compartment is observed for 10 μM Eu(III)-SRFA complexes: R_H values increase when $C_{SRFA} < 300 \text{ mg}_{SRFA}/\text{L}$, and then seem to decrease for C_{SRFA} of 500 $\text{mg}_{SRFA}/\text{L}$. R_H are almost identical at C_{SRFA} of 500 $\text{mg}_{SRFA}/\text{L}$ regardless of pH and C_{Eu} . These slight decreases in R_H observed with C_{Eu} are most likely indicating a change in the complex structures which can be molecular compression due to a decrease in intramolecular repulsions.

[1] Kouhail *et al.*; Environ. Sci. Technol. **50**, 3706-3713 [2] Kinniburgh *et al.* (1999) Colloids Surf. A **151** 147-166. [3] Saito *et al.* (2009) Colloids Surf. A **347**, 27-32. [4] d'Orlyé & Reiller (2012) J. Colloid Interface Sci. **368**, 231-240.