

Charge reversal and aggregation of humic substances: Effect of hydrophobic interactions

*AZIZUL HAKIM¹, MOTOYOSHI KOBAYASHI²

1. Graduate School of Life and Environmental Sciences, University of Tsukuba, Japan , 2. Faculty of Life and Environmental Sciences, University of Tsukuba, Japan

Humic substances (HSs) the colloidal macromolecules present in soil and water environment act as recalcitrant organic carbons. These humic substances are transported to surrounding water bodies along with other inorganic and organic ions. The surface charge, sizes, and aggregation of the HSs are also affected by the oppositely charged ions adsorption on its surfaces depending on the pH of the environmental condition. Hydrophobic dyes and pollutants are used recent days in the different industry and released to the surrounding environment affecting the natural functions, binding and releasing ability of ions by HSs. Considering these environmental issues we focus on the charging and aggregation behaviors and properties of HSs aggregates using monovalent hydrophobic cations TPP⁺ (tetraphenylphosphonium ion), CPC (Cetylpyridinium chloride) and also in simple KCl solutions. All the studied humic substances (HSs), Suwannee river fulvic acid (SRFA), Suwannee river humic acid (SRHA) and Leonardite humic acid (LHA) in the presence of hydrophobic cations tetraphenylphosphonium TPP⁺ showed charge reversal and formation of large aggregates. We used Suwannee river fulvic acid (SRFA) and Leonardite humic acid (LHA) in CPC solutions. These HSs in CPC solution also showed charge reversal and formation of large aggregates. The LHA showed large aggregates in all pH especially at low pH in TPPCl solution whereas in CPC solution it shows pronounced aggregation near around iso-electric point especially toward the charge reversal pH of HSs. Meanwhile, the HSs showed no charge inversion in KCl solution. The aggregates of LHA showed higher aggregates strength than SRFA aggregates in CPC measured by the breakup of aggregates subjected to a laminar converging flow.

References

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