

【Grant-in-Aid for Scientific Research (S)】

Biological Sciences (Agricultural Sciences)



Title of Project : Environmental Interface Engineering Based on Dynamic Analysis of Colloidal Flocculation

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Research Project Number : 16H06382 Researcher Number : 70192466

Research Area : Agricultural engineering

Keyword : Inhomogeneous colloid, flocculation, sedimentation, electrokinetics, bioresources

【Purpose and Background of the Research】

Any kind of nutrients, minerals and hazardous substances present in nature and water environment, are apt to be adsorbed and to be concentrated on the surface of environmental colloidal particles, such as clay or fine organic matters. This tendency will be enhanced for chemical substances with high hydrophobicity such as dioxin or heavy metals. In addition, these particles will have a tendency to aggregate into large flocs. Under such condition, flocs are more important unit of transportation rather than individual colloidal particles.

The objective of this research is to carry out the systematic analysis of flocculation dynamics focusing that colloidal system in nature and engineered system is composed of nano-particles and dissolved organic matters under the condition of turbulent flow. On the basis of obtained results, the engineering science of colloid and interface in soil and water and biological system will be created and developed in various directions.

【Research Methods】

The three subjects, ①dynamics of flocculation of colloidal particle involved in the adsorption of organic molecules in a flow field ②electrokinetics of porous colloidal complex ③sedimentation and rheology of flocculated material, will be placed as core domain, in which advanced analysis of theoretical and experimental aspects are systematically implemented. Obtained results and developed methods, will be utilized in the analysis on ④the solid-liquid separation of concentrated suspension, ⑤flocculation and electrokinetics of the colony of micro-biology, ⑥ formation process of water-quality structure in eco-system. Systematic engineering development will be automatically done throughout these utilization activities (Figure1) . More generally, analogical consideration in the description of colloidal phenomena in the wide domain of bio-resources science will be carried out.

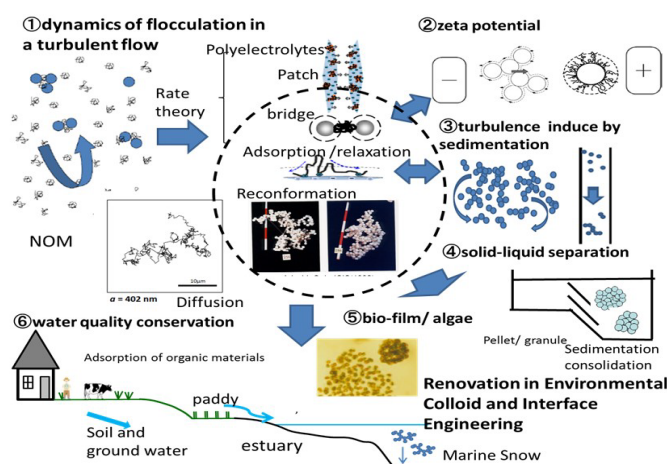


Figure.1 Scheme of Study

【Expected Research Achievements and Scientific Significance】

Understanding of flocculation dynamics is a key factor to clarify the relation between microscopic interaction of colloidal particles and macroscopic transport phenomena. Analysis of the rate theory of flocculation between colloid particles with inhomogeneous surface properties with porous structure is new and will largely contribute to the understanding of more practical system.

【Publications Relevant to the Project】

Tsuchi no koroid gensho - physical chemistry of soil and water environment - ,Yasuhisa Adach, Shingo Iwata, Gakkai Shuppan Center (2003)
Dynamics of polyelectrolyte adsorption and colloidal flocculation upon mixing studied using mono-dispersed polystyrene latex particles, L.Feng, M.A. Cohen Stuart, Y. Adachi, Adv. in Colloid and Interface Sci.226, 101 – 104 (2015)

【Term of Project】 FY2016-2020

【Budget Allocation】 102,000 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.agbi.tsukuba.ac.jp/~colloid/>