CHIBA UNIVERSITY

A+B

Applied Chemistry and Biotechnolog

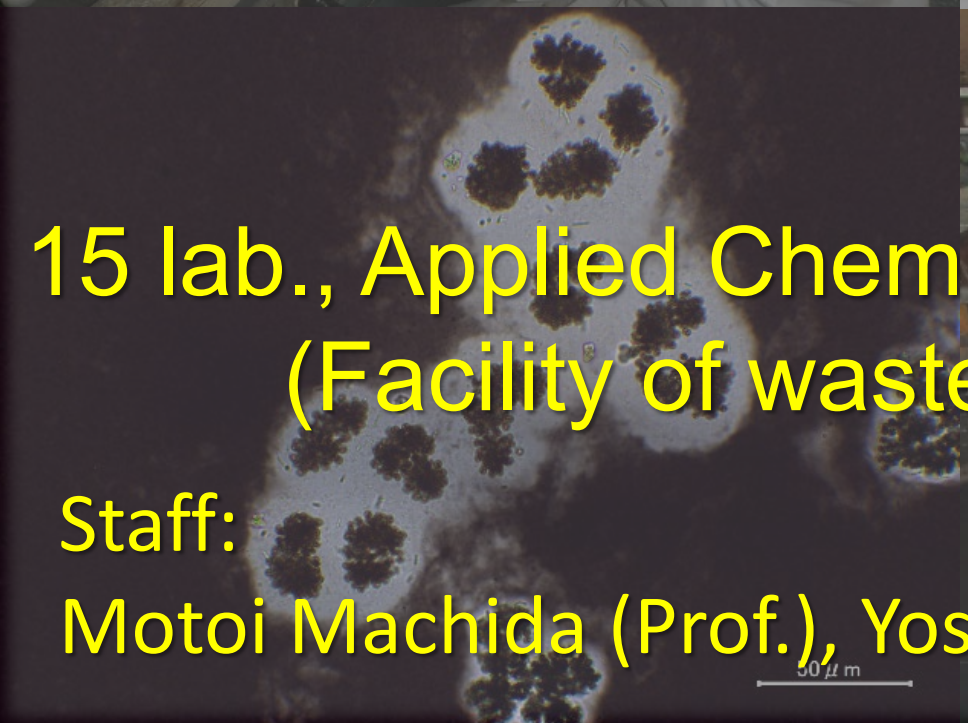
共生応用化学コース・第15研究室
（有害廃棄物管理棟）

指導教官：町田　基（教授），天野佳正（助教）

15 lab., Applied Chemistry and Biotechnology
(Facility of wastewater treatment)

Staff:

Motoi Machida (Prof.), Yoshimasa Amano (Asst. Prof.)



研究分野：

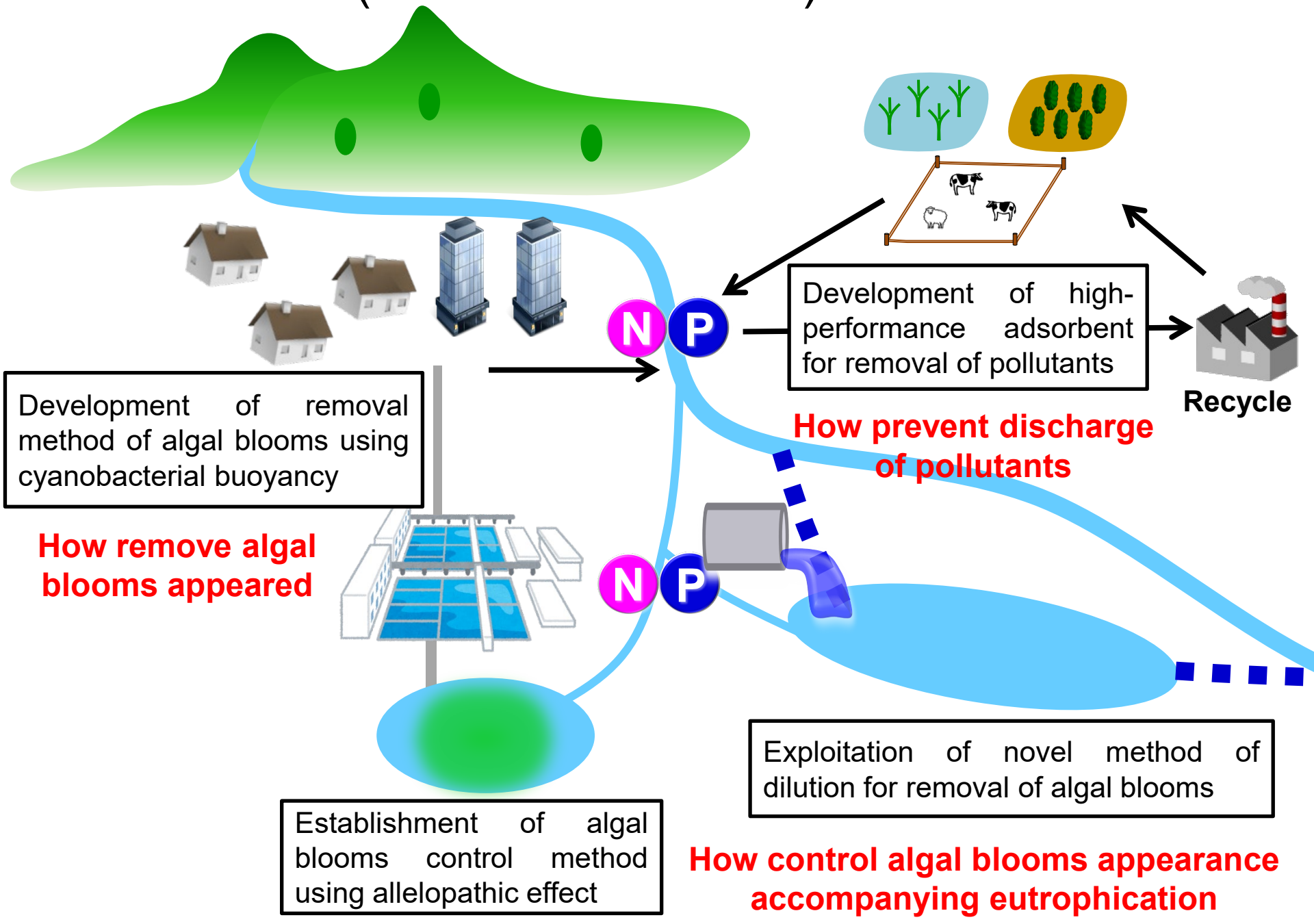
環境化学，環境工学（汚染物質の除去および水質浄化 ）

研究のキーワード：

栄養塩（窒素・リン），重金属，有害汚染物質（有機物），
活性炭，活性炭素繊維，物理化学賦活，イオン交換
表面構造制御（表面積，細孔容積，表面官能基）

富栄養化，湖沼，アオコ，ミクロキスティス，群体形成，
浮揚性制御，藻類の優占化，藻類の種変遷機構，
実験室培養，導水法，アレロパシー効果

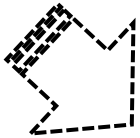
Research field (Water environment)

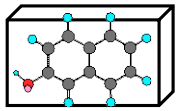


➢ Preparation of high performance-activated carbons

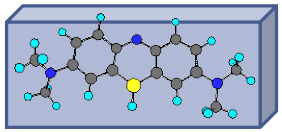
High surface area
~1000 m^2/g or more

Moisture (humidity)





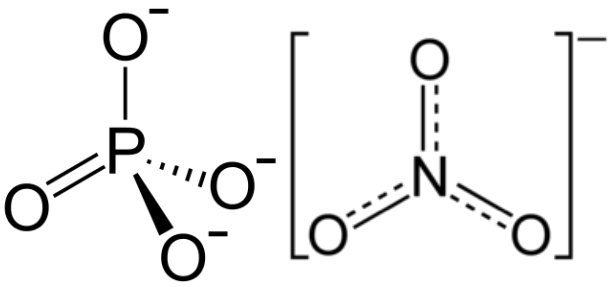
2-Naphthol



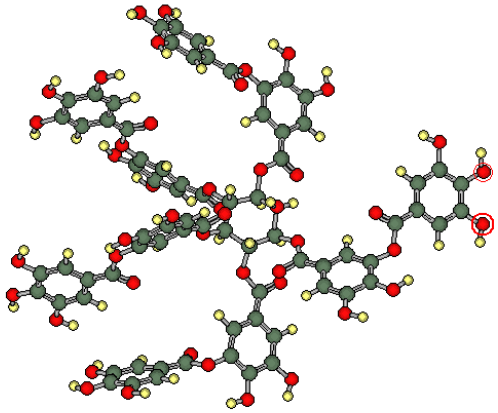
Methylene blue

Low molecule pollutants

Treatments to remove various pollutants



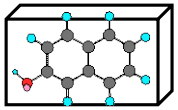
Ionic ions



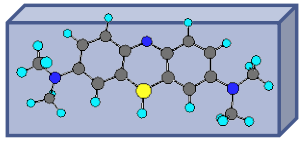
Huge molecule pollutants

Heavy metals

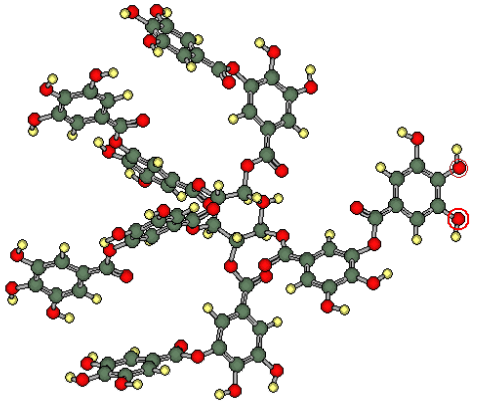
➢ Control of pore size of activated carbon



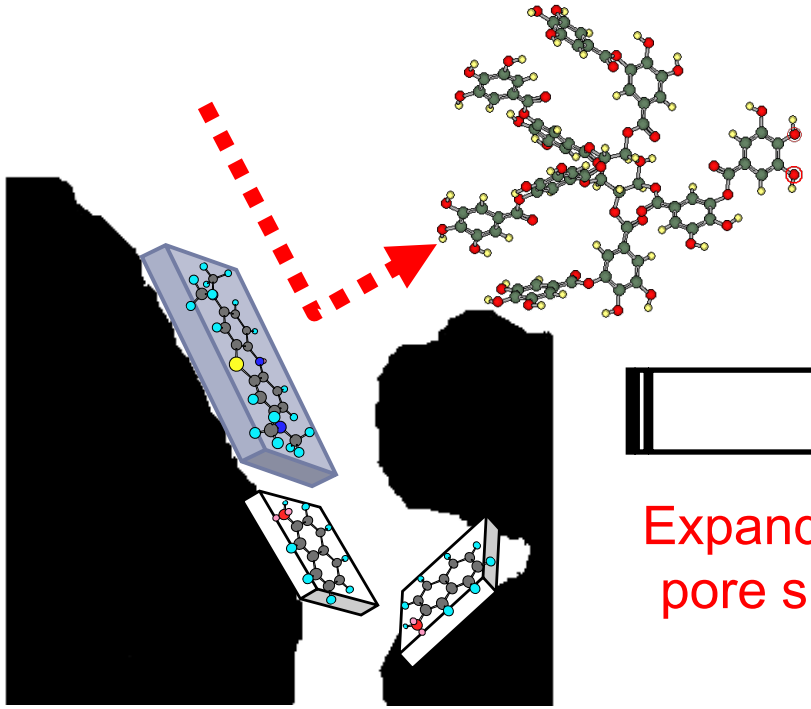
2-Naphthol (MW: 144)



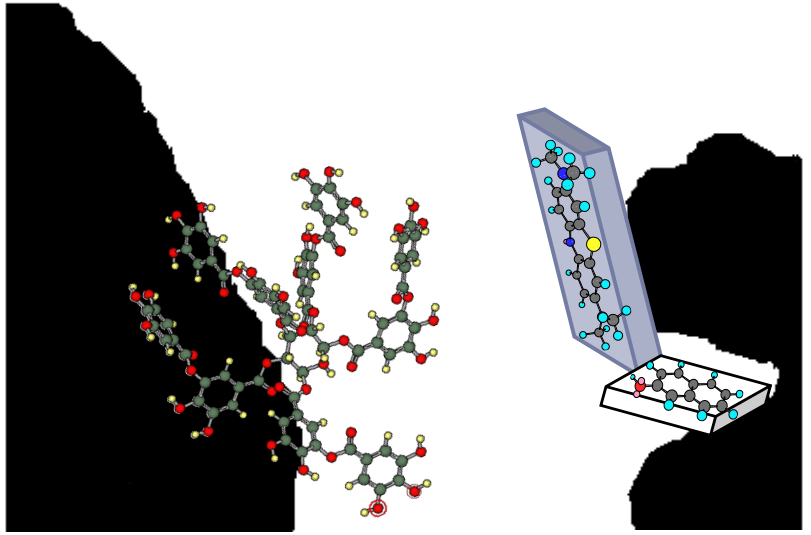
methylene blue (MW: 320)



Tannic acid (MW: 1700)



Expanding pore size

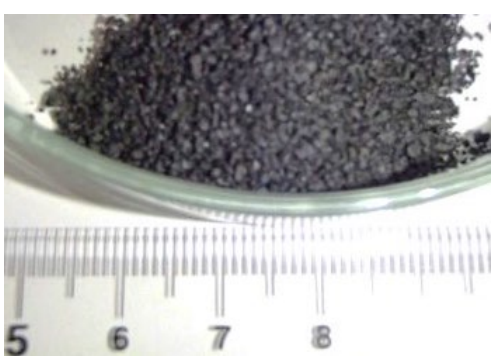


Micropore-AC (< 2 nm)
(commercial AC)

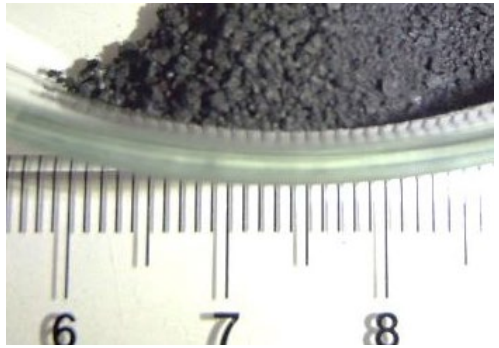
Mesopore-AC (> 2 nm)

By expanding pore size (pore volume) via $ZnCl_2$ treatment, huge molecule pollutant such as tannic acid could be adsorbed.

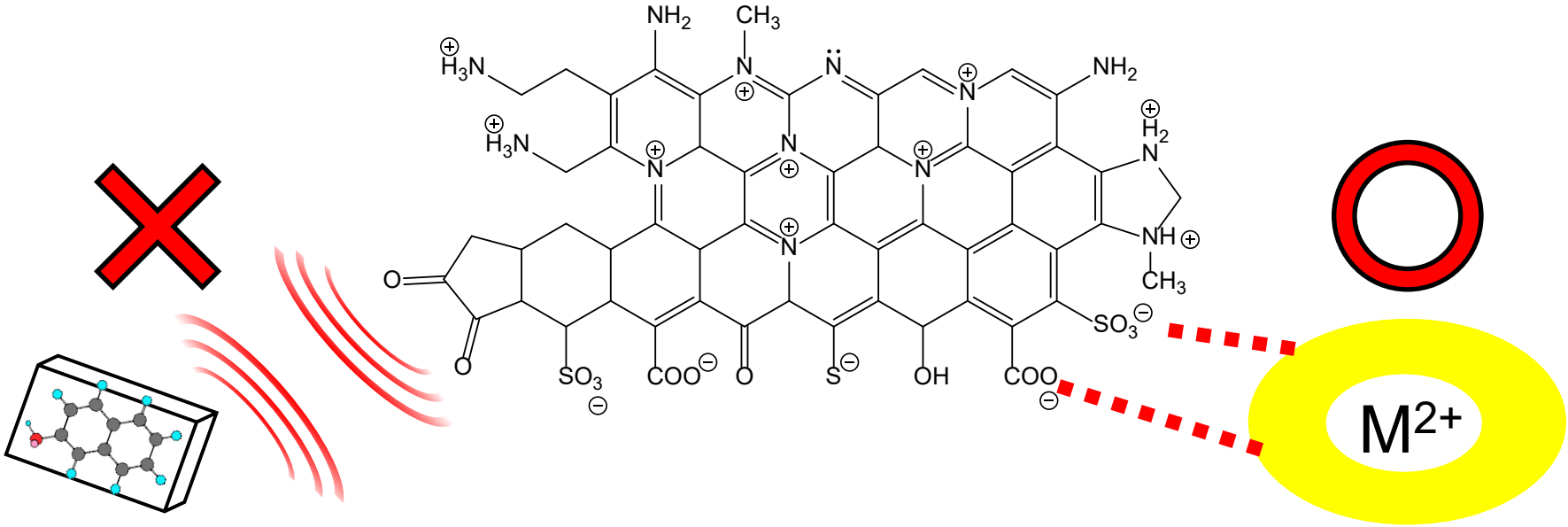
➢ Introduction of acidic functional groups



HNO_3 oxidation



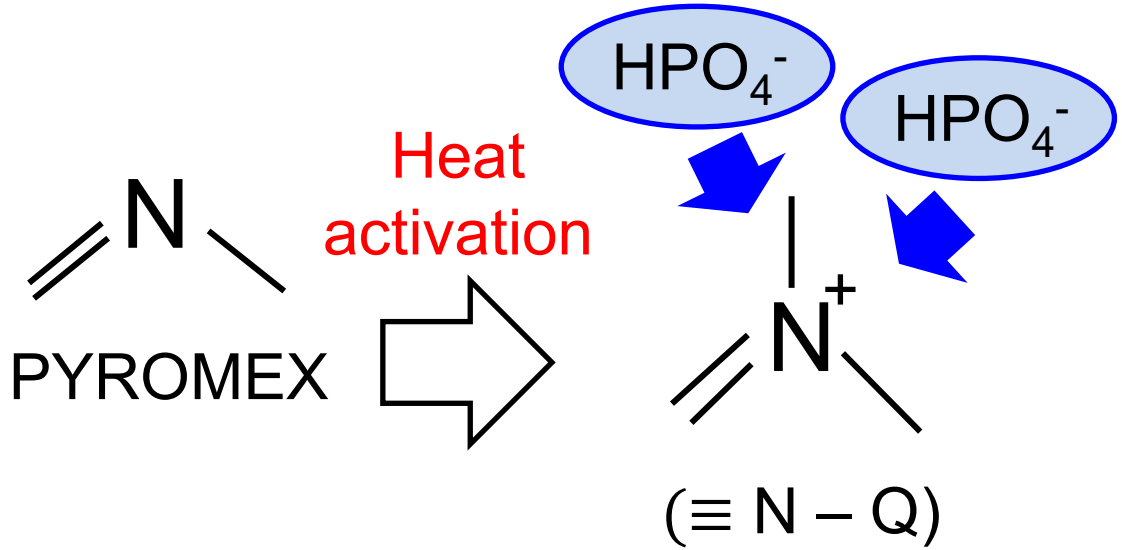
Oxidized AC

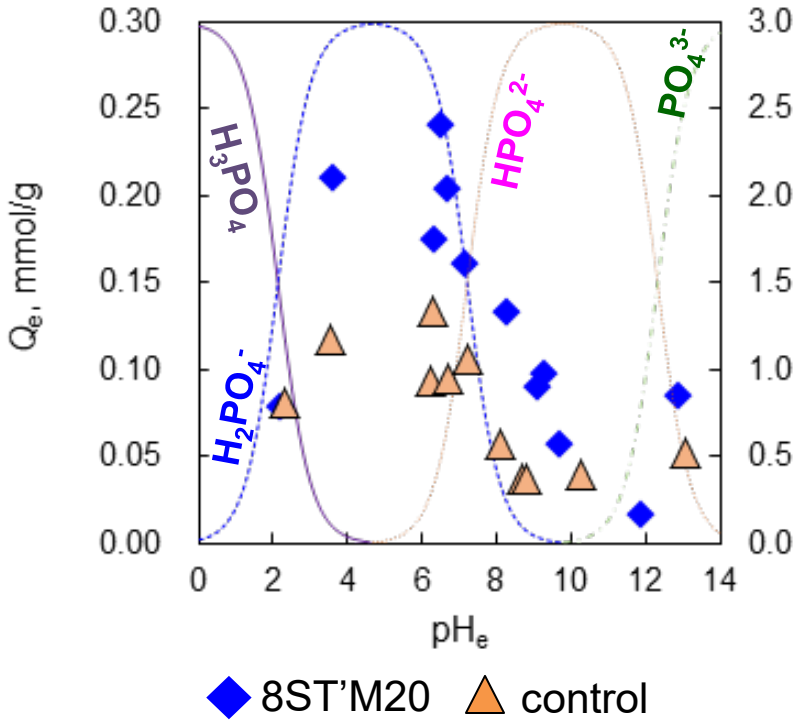


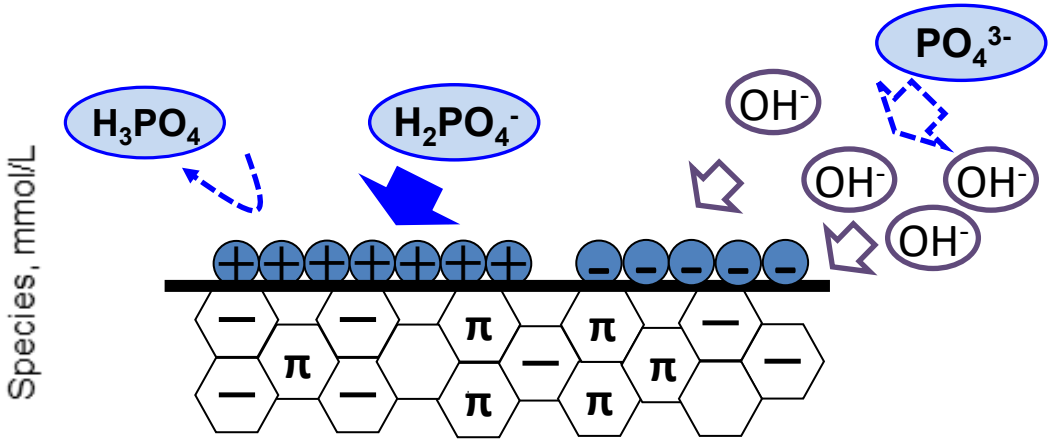
By introducing surface functional groups (-COOH, -SO_3H), the adsorption amount of cationic ions could be enhanced.

➢ Quaternization of activated carbon fiber

N-enriched (N: 20.9 wt%) polyacrylonitrile ACF

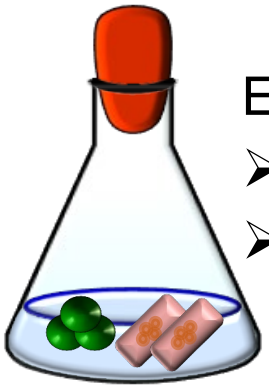






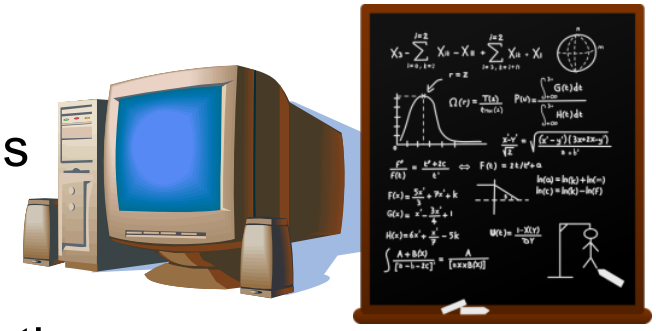
By quaternization of ACF, phosphate adsorption was enhanced compared to control.

➢ Development of novel dilution method using river water for control of algal blooms (*Microcystis*)



Environmental factors
- ➢ Amount of dilution
- ➢ Nutrient conc.

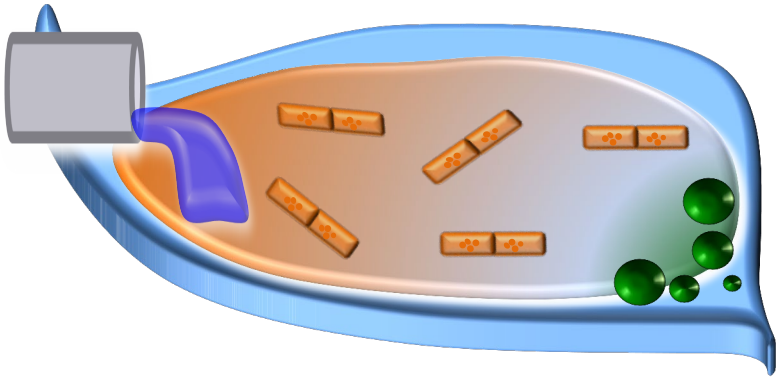
Numerical analysis

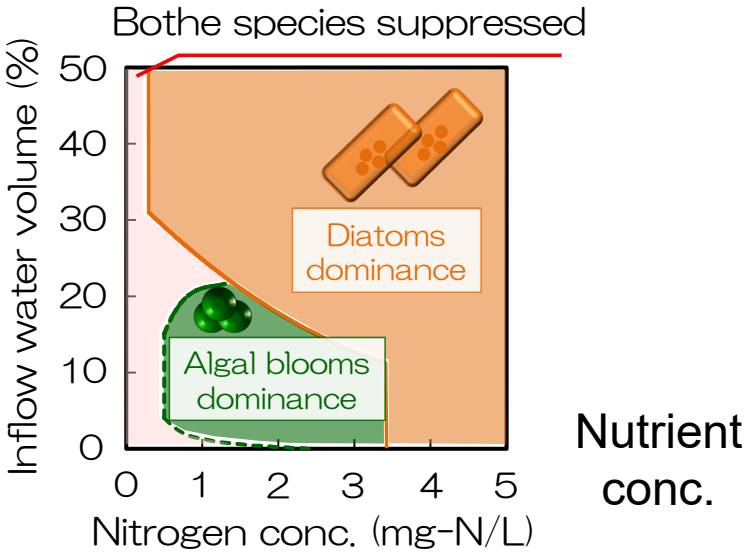


Experimental verification

Characteristics of dominance between *Microcystis* and competitor (diatom)

Development of prediction model for *Microcystis*

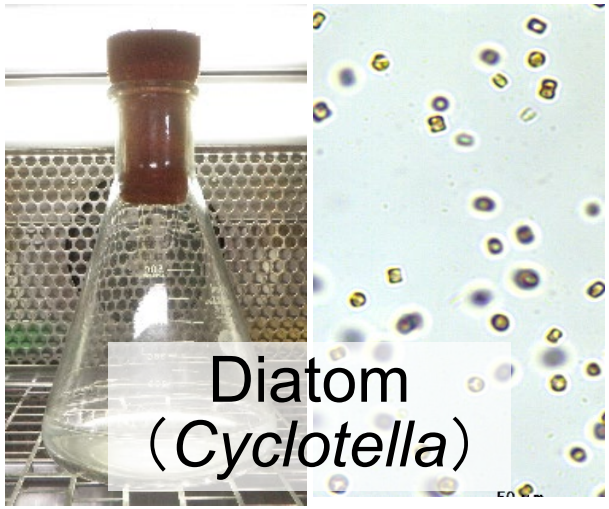




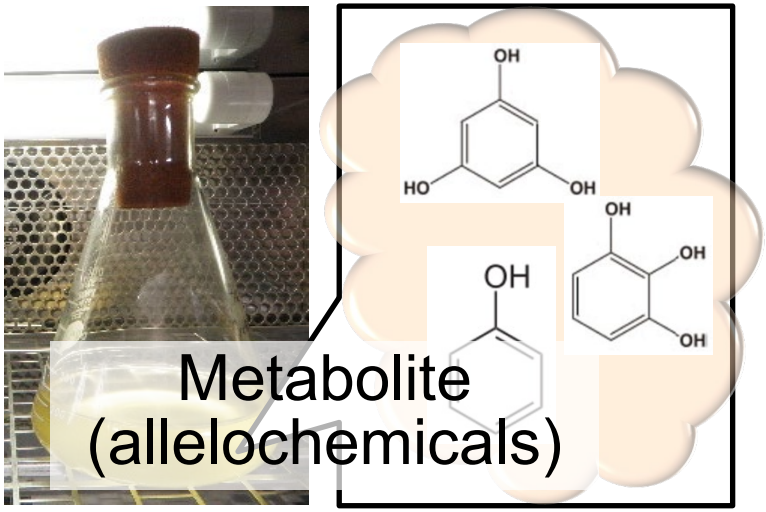
Determination of dilution conditions for control of *Microcystis* in lakes

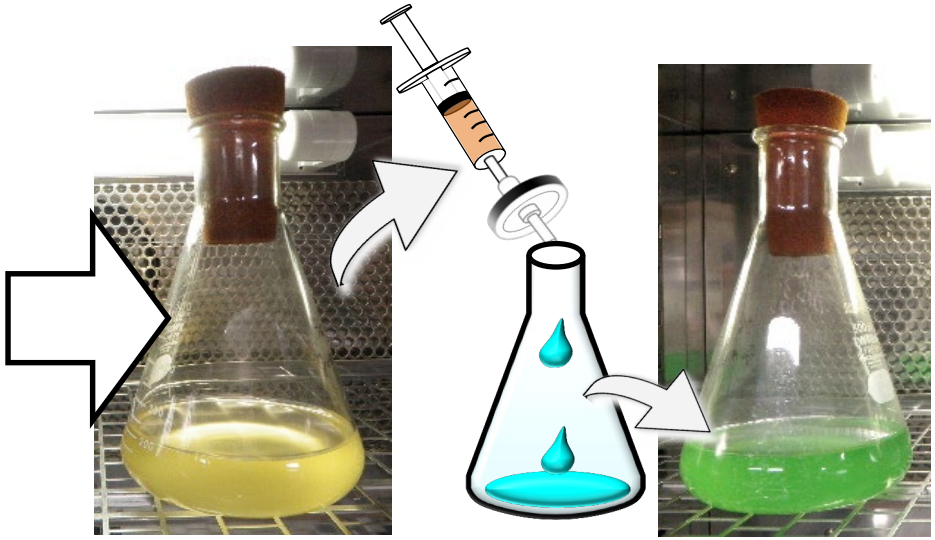
Prediction of dominance between *Microcystis* and competitor (diatom)

➢ Control of *Microcystis* using allelopathic substances (allelochemicals) produced by *Cyalotella*



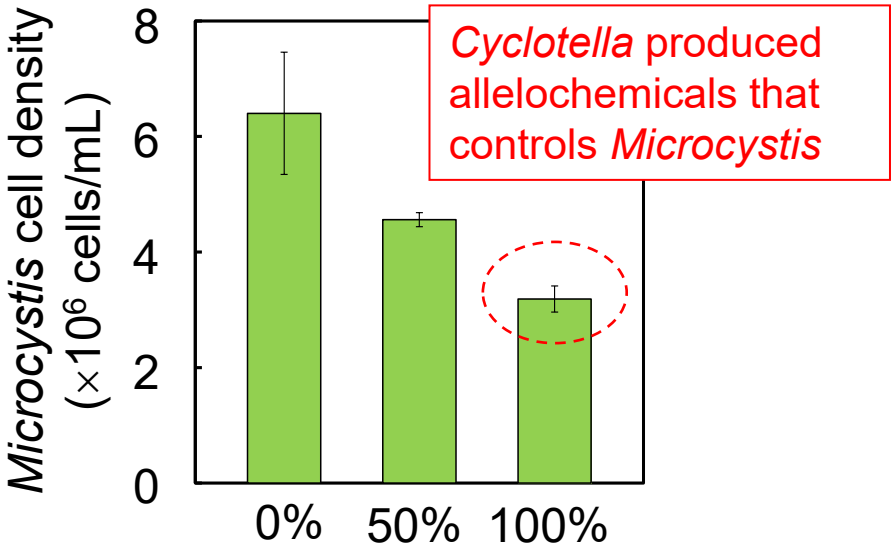
- Cultivation
- Growth





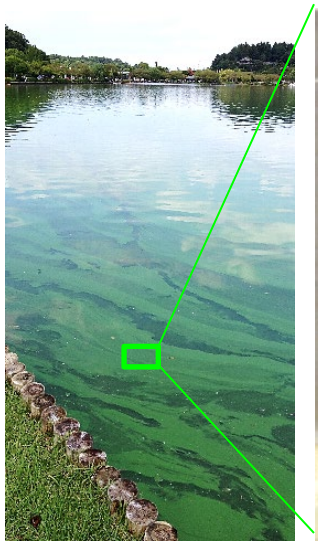
Filtrate of *Cyclotella*
(Allelochemicals)

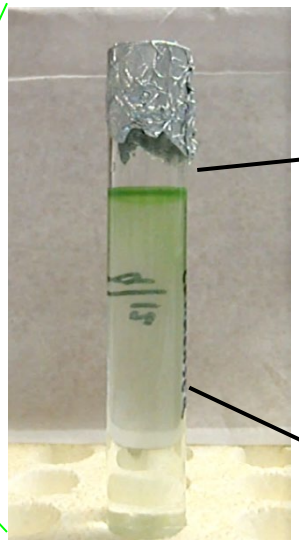
Microcystis



Content of filtrate (%) of *Cyclotella* medium

A novel approach for *Microcystis* removal by enhancing colony formation and buoyancy

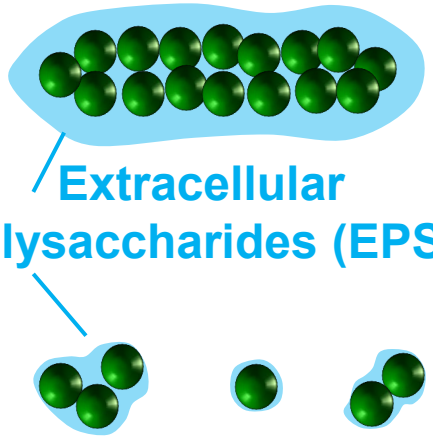




Cyanobacterial blooms

Upper layer

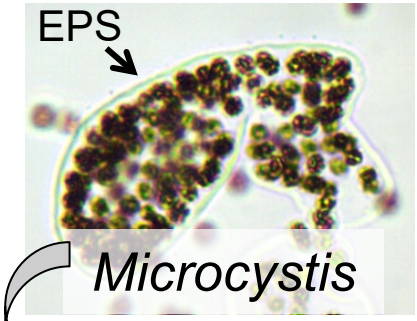
Lower layer

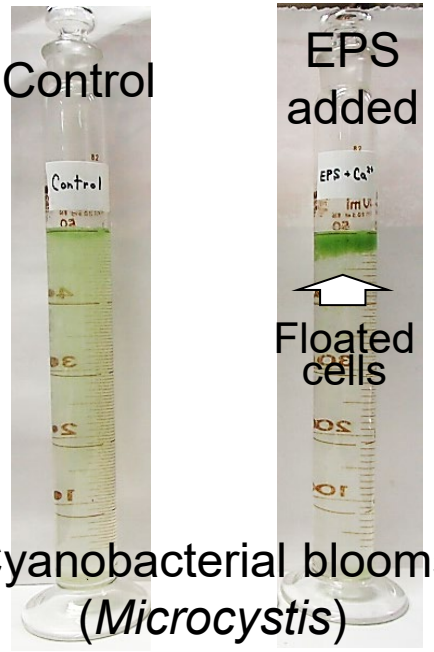


Extracellular polysaccharides (EPS)

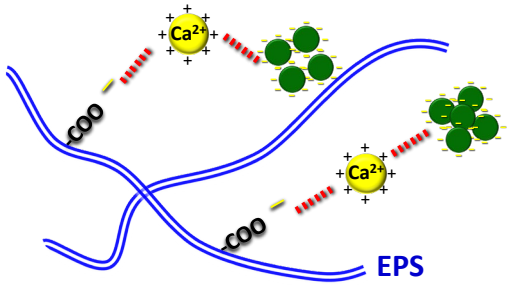
- EPS amount : high
- Colony formation : strong
- Buoyancy : strong

- EPS amount : low
- Colony formation : weak
- Buoyancy : weak

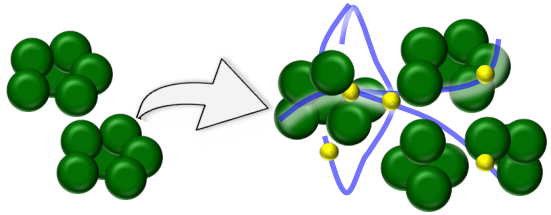




Cyanobacterial blooms (*Microcystis*)



Cross-linked reaction of Ca^{2+}



- Colony size expansion
- Promotion of buoyancy