

Development of functional hydrogel painting for fuel-efficient ship



Okano laboratory

Drag reduction for ship

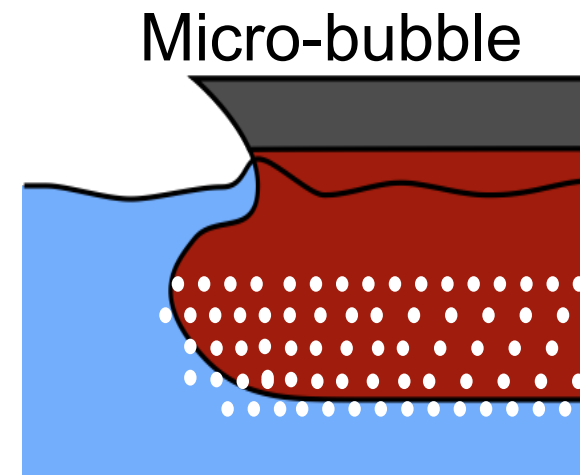
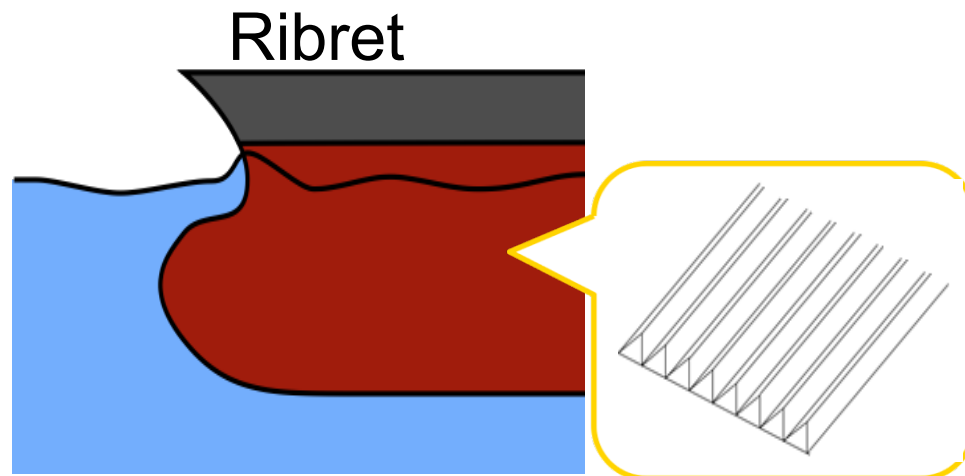


870 million ton of
CO₂ emission in a year



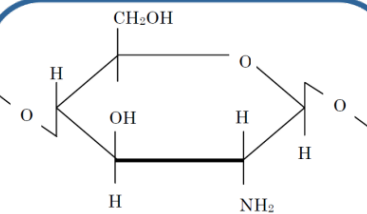
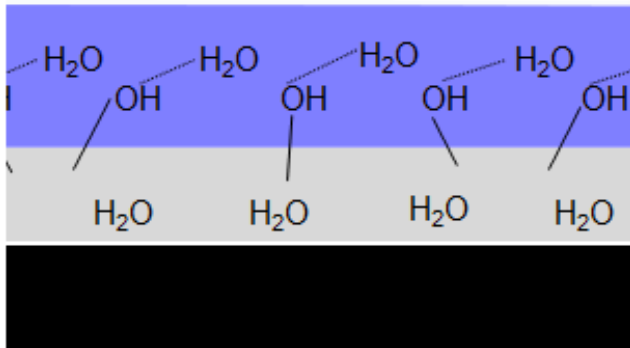
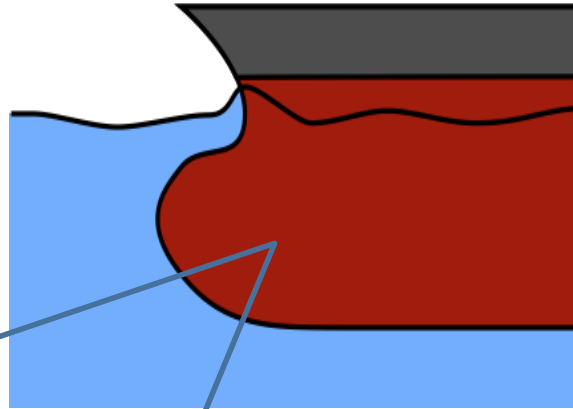
Large Frictional drag

Previous research



	Drag reduction mechanism	Problem
Ribret	Controlling of disturbed flow	Biofouling
Micro-bubble	Controlling of external energy	High cost

Hydrogel coatings



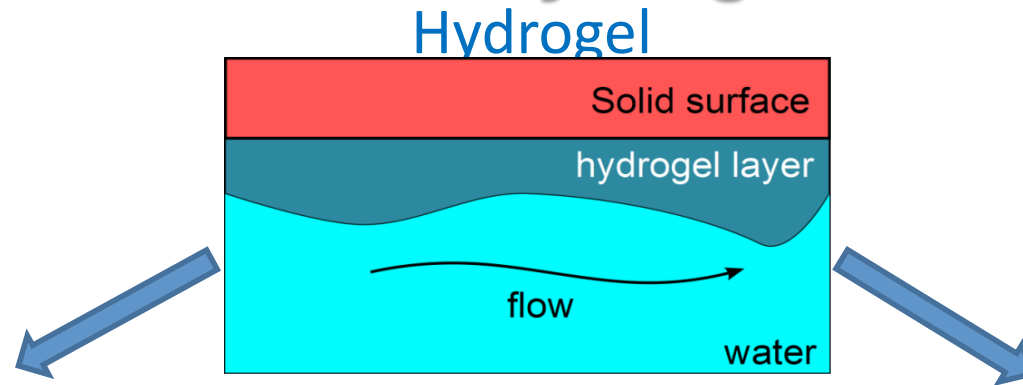
Chitosan

Environment-Friendly
And
Easy Application

Object

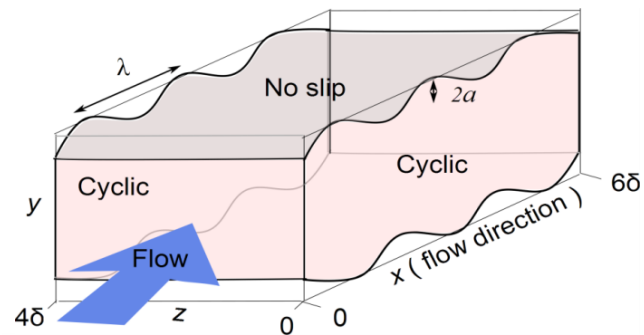
Investigation of drag reduction mechanism
of hydrogel coatings

Numerical simulation for hydrogel surface modeling



Drag increase

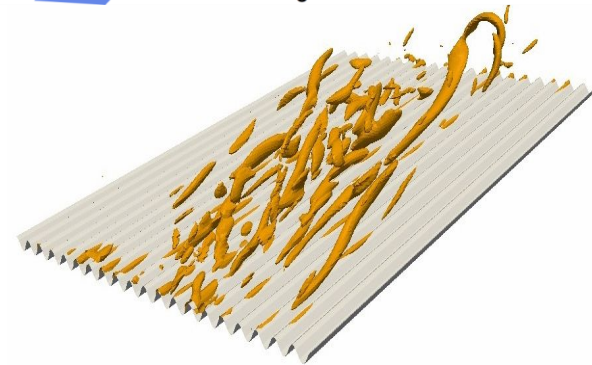
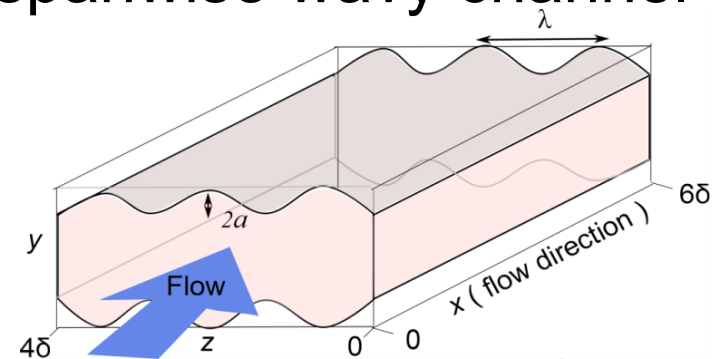
streamwise wavy channel



DR = -20.4 %

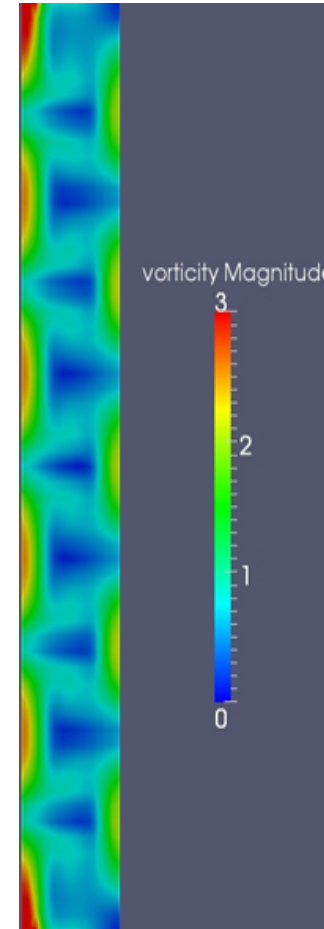
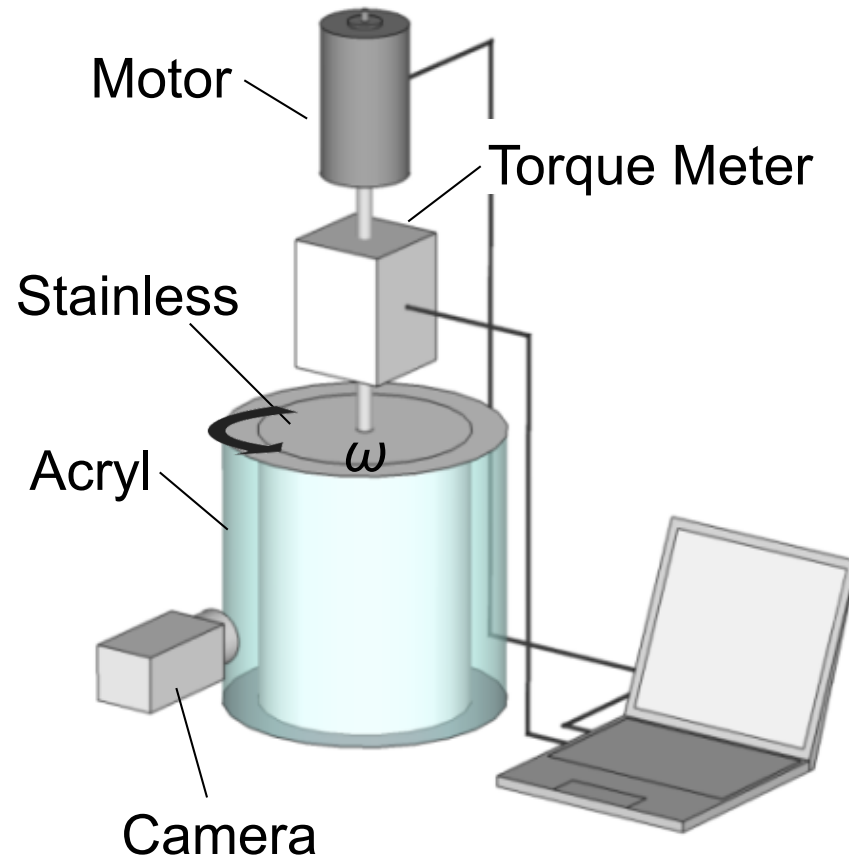
Drag reduction

spanwise wavy channel

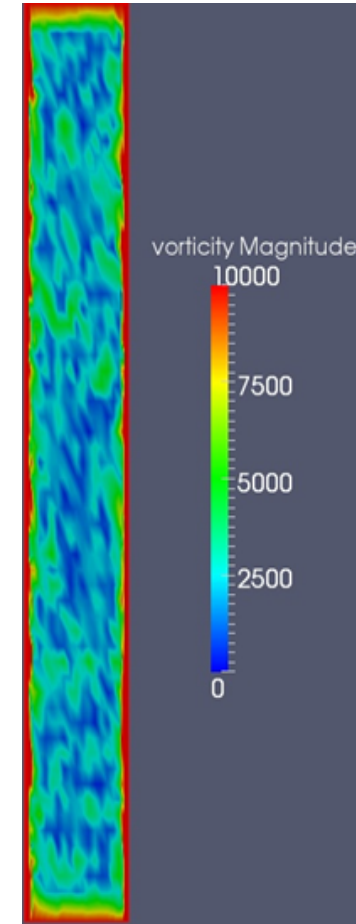


DR = +9.3 %

Experiment and numerical simulation by using a rotating cylinder facility



Steady vortexes



Turbulent

Investigation of drag reduction of hydrogel by using a rotating cylinder facility