

# ARCRESPO – Towards Efficient and Sustainable Arctic Oil-Spill Response

## Oil dispersion by cross-combination of chitosan and orange peels

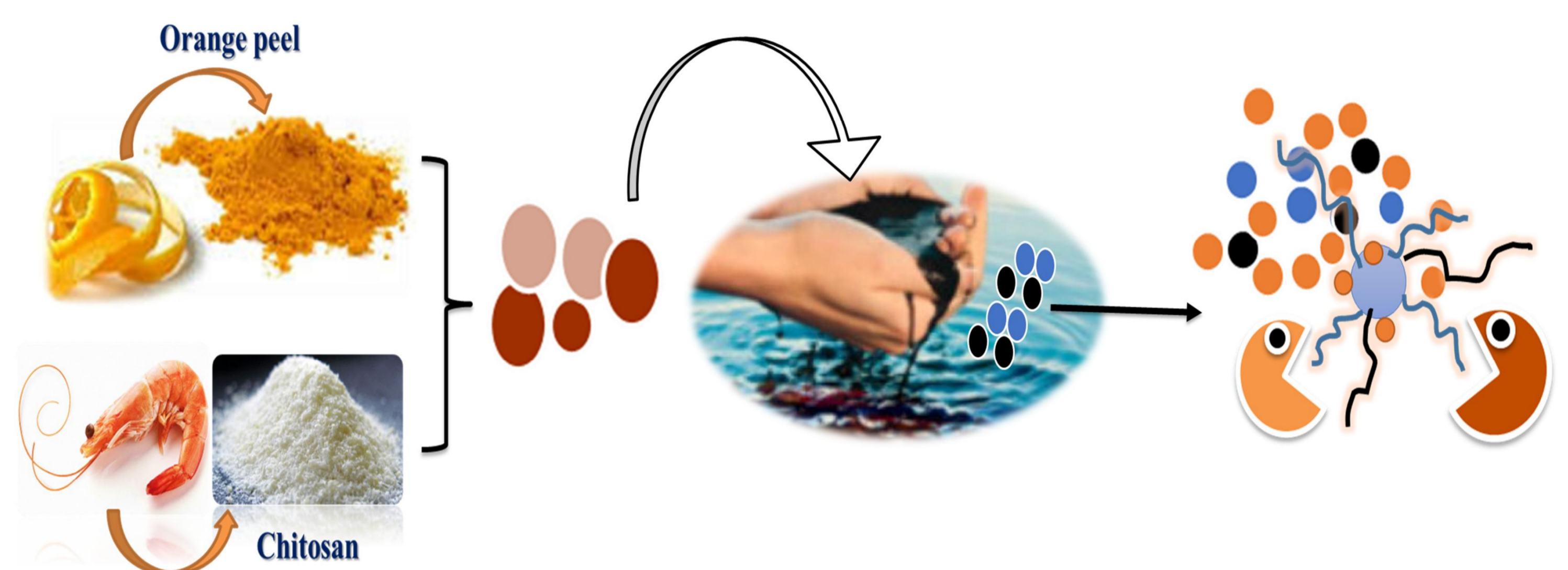
### Members of the research group

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### Introduction

ARCRESPO project is based on development of green dispersing and herding agents for the Arctic oil-spill response from natural bioresources such as chitosan and cellulose. The project partner in ARCRESPO is University of Oulu.

The utilization of commercial dispersants for oil-spill treatment is banned due to its toxicity in some Arctic countries. Hence, an approach of using bio-waste as one of the components in dispersant formulation can minimize the traces of hazardous chemicals in the marine ecosystem as well as enhance oil bioremediation.



### Main Results

The addition of hydrophobic moiety on the chitosan surface enhanced the emulsion stability, but, its effectivity stepped down with increased in salinity. Moreover, cross-combination of hydrophobic chitosan with orange peel powder regained the emulsion stability even at seawater salinity. The oil droplet size would be greater than 100  $\mu\text{m}$  for gel-like emulsion and less than 100  $\mu\text{m}$  for creamy emulsion. The behaviour of emulsion vary with different types of oil.

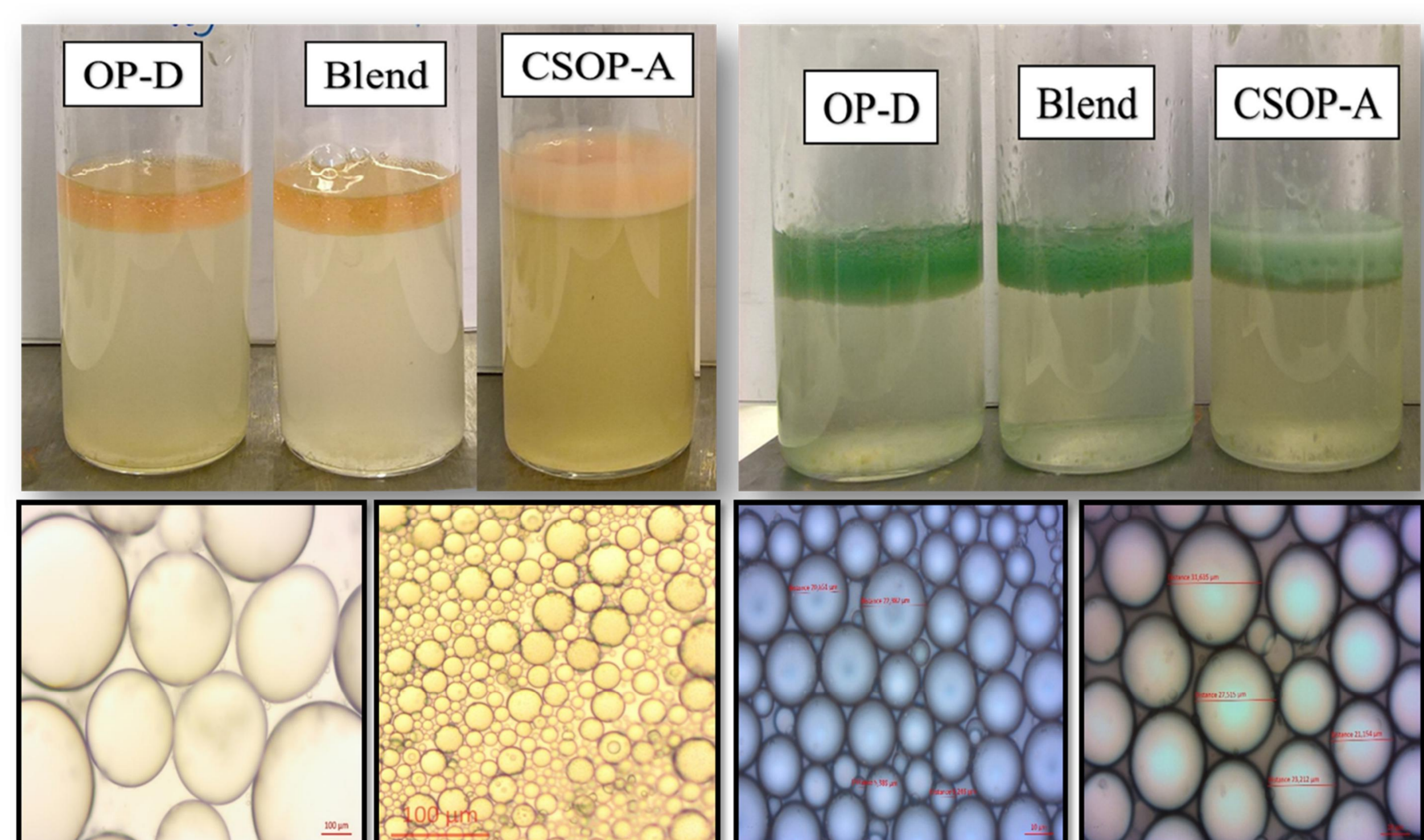


Figure 1: Destabilization of marine diesel (pink in colour) and 2T-oil (green in colour) using different quality of water along with microscopic images of oil droplets.

There was a direct influence by temperature on oil-droplet formation and its stability. The emulsion formed at room temperature was most stable, and at  $-20\text{ }^{\circ}\text{C}$  this rate decreased to 10%, but the destabilization rate was not affected much at  $2\text{ }^{\circ}\text{C}$  except the increase in droplet size, so this bio-based surfactants could be used in dispersant formulation even at Arctic temperatures.

Various biosurfactants derived from varied microbial sources are present in the water, enhancing the biodegradation of the dispersed oil through bioremediation. Chitosan being biodegradable and non-toxic, its derivative does not show adverse effect on the marine ecosystem and similarly orange peel act as a substrate for *Bacillus Licheniformis* biosurfactant production and the biodegradation of hydrocarbons. So traces of such surfactants in the water resources might not be toxic compared to commercial dispersants.

### RESEARCH GROUP CONTACT DETAILS

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