ARCRESPO

TOWARDS EFFICIENT AND SUSTAINABLE ARCTIC OIL-SPILL RESPONSE

Enhancing the Arctic Oil-Spill Response with Nanocelluloses

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BACKGROUND OF ARCRESPO –PROJECT

In this project, novel dispersing and herding agents from natural bioresources for Arctic oil- and chemical spill response are developed. Processing of materials is based on green chemistry and targeting into sustainable and efficient use of natural resources, cellulose and chitosan. The project partner in ARCRESPO is Lappeenranta University of Technology.

Increased oil transportation and oil drilling in Arctic areas increase also the risks of potential oil-spills. One of the most potential method for oil-spill response in icy and windy environment is the use of oil dispersants. However, the commercial dispersants are reported to be toxic to ecosystem and are believed to lead to long-term effects on human health as well. For these reasons, some Arctic countries have restricted or even banned the use of commercial dispersants.

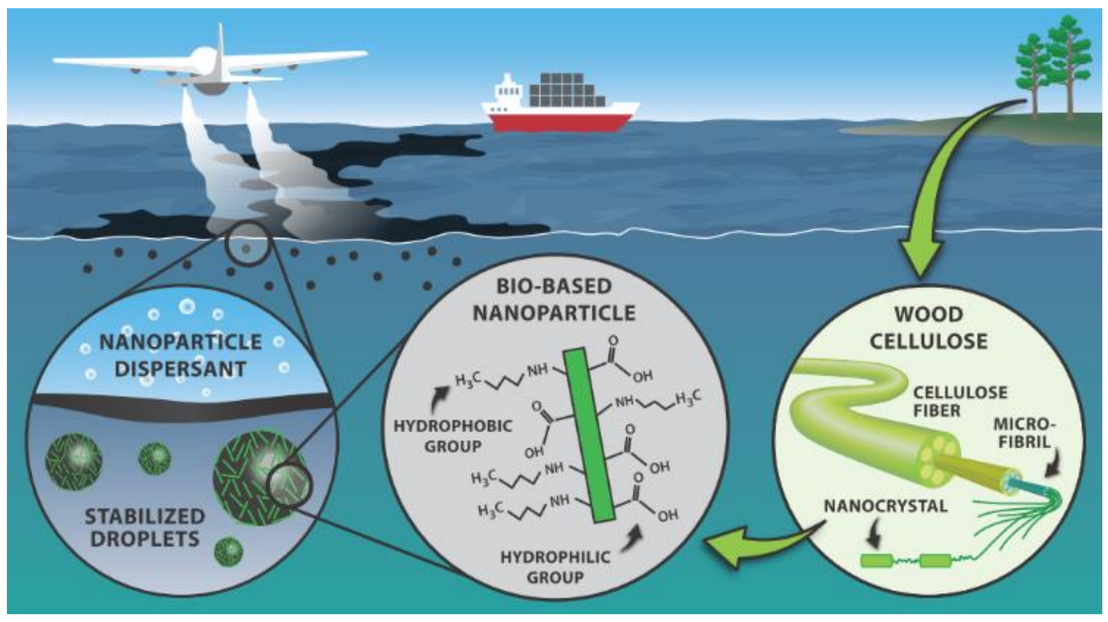

Figure 1 Fabrication route for cellulosic nanoparticle dispersant towards enhanced oil response.

APPROACH

Dispersants break the oil slick into small droplets to ensure the natural microbial degradation of oil. Here cellulose raw material was first chemically modified and then nanofibrillated to obtain nanocellulose particles to be used in oil-in-water emulsions as stabilizing agent.

Within the Arcrespo -project, green, nontoxic surfactants from renewable biopolymers, cellulose and chitosan, will be fabricated using sustainable chemical modifications.

RESULTS

Nanoparticles in o/w emulsions prevent the oil droplet from coalescing by absorbing irreversibly at the oil water interface. This phenomena enables the oil droplet size to remain favourable in biodegradation process. In our research, obtained cellulose nanoparticles showed efficient stabilizing characteristics against creaming effect as well as droplet coalescence that are the most probable routes for de-stabilization of o/w emulsions.

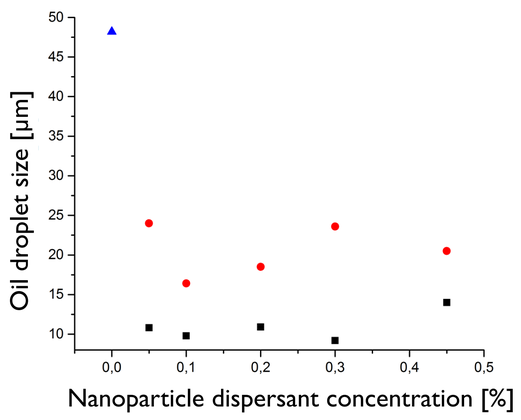

Figure 2 The effect of two different nanoparticle dispersants (red / black marks) on oil droplet size in different concentrations. The reference oil droplet size in non-stabilized emulsion is 48µm.

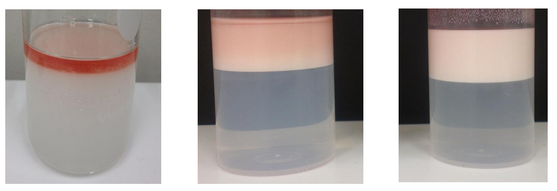

Figure 3 o/w emulsions with no nanoparticle stabilizer (left), poorly stabilized (middle, reddish color indicating the coalescence) and well stabilized (right) with cellulose nanoparticles.

CONCLUSIONS

Our product will provide a bio-based alternative for oil dispersants. Since it is produced from wood cellulose, it is more environmentally safe and causes no harm to humans.

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