

Annual and Biannual report VISTA 2011

Project title

Synthesis and characterization of novel nanoparticles for enhanced oil recovery applications; development of superabsorbent gels for absorbing oil spills

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Project duration:	<u>01.02.11 – 31.01.13</u>
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Project number:	6506

Object

The object of this project is to find and/or design an optimal microgel/nanogels system for polymer reservoir flooding, it also addresses how to recovery oil from oil spills in the sea by use of new superabsorbent gel. The aim of the project is to design and synthesis new polymeric microgels that can sustain the conditions of temperature, hydrostatic pressure and salinity that reign in the reservoirs in the North Sea. The employed polymers/materials should be environmentally friendliness. The drilling for oil in the seabed and the transportation of oil across the sea always involves the risk of oil spills with the consequential environmental problems. In the second part of this project, we propose to develop new superabsorbing/hybrid microgels/nanogels. The gels should be reasonable cheap and simple to make on a large scale, environmentally friendly, and able to absorb several times their own weight of oil, without absorbing any significant amount of water.

Status:

In the past 5 months, we have finished the literature study of the different materials for using the oil spills cleanup and polymer/nanogel/microgels for EOR application. We have now designed and synthesized a new kind of highly hydrophobic hybrid “core-shell” microgels with an inorganic nanosized magnetic iron oxide/SiO₂ ‘core’, while vary the ‘shell’ with different kind of polymers/copolymers of variety functional environmental stimuli materials. The primary organic solvent absorption test shown that these polymers shell with nonpolar side chain hydrophobic elastic network such as longer alkyl substituents, bulkiness such as cyclodextrin (CD), polyhedral oligomeric silsequinoxane (POSS) groups on the fabrication of the crosslinked polymer providing large cavities/big surface areas can significantly enhance the solvent absorbency. The magnetic core provided an alternative method for the fast and selective removal of any hydrophobic organic spill from water surface via highly hydrophobic core-shell nanogel under external magnetic field.

In the next step we will synthesize some new microgels with environmentally friendliness monomer such as N-vinylcaprolactam (VCL), oligo-poly(ethylene glycol)-methacrylate (OPEG-MA), as well as some nontoxic crosslinker-beta-cyclodextrin-containing crosslinker (CD-AA), biodegradable crosslinker-polycaprolactone-acrylate (PCL-AA). These new microgels will then be well characterized with the aim to find which of them that are best suited for EOR applications.

Publications: