Zahra Sadeghian, J Material Sci Eng 2017, 6:6(Suppl)
DOI: 10.4172/2169-0022-C1-076

Superhydrophilic functionalized graphene oxide-ceramic composite membrane for enhanced oily produced water treatment

Zahra Sadeghian
Research Institute of Petroleum Industry, Iran

The largest wastewater stream is generated in oil and gas industries. In order to meet environmental regulations as well as reuse and recycling of produced water, treating oily produced water is very important. In this research, nanofiltration (NF) membranes with functionalized graphene oxide (F-GO) for wastewater treatment have been worked on. In this work, the synthesized GO from our previous work (Fig. 1a) was first functionalized with polyethyleneimine (PEI). The PEI–GO thin film has been constructed on home-made microporous γ-alumina/alumina substrate to enhance and improve the characteristics of nanofiltration (NF) alumina membranes. Fig. 1b shows microstructure of ceramic membrane surface modified PEI-functionalized GO representing compressed thin layers. The interactions between PEI–GO and the alumina matrix are caused to make passageways for water rapidly passing through membrane. Also the contact angle and zeta potential results showed a notable increase in surface hydrophilicity of the thin layers accompanying presence of positively charged PEI. The filtration properties of the membrane were tested by home-made cross flow NF using oily wastewater with oil concentration of feed 5000 mg/L. High oil (>99%) and total organic carbon (TOC) rejection (>99%) was obtained using the prepared membrane. Also the water flux was almost 10 times higher than that of the pristine alumina membrane. The permeation flux-decline is decreased to an ultralow level (less than 1%) that it turns to the antifouling layers on modified membrane surface. The superior antifouling property is mainly focused on surface structure of the membrane such as superhydrophilic character and charge of the modified alumina surface. As a result, the PEI–GO/alumina hybrid membrane showed an effective method for preparing composite NF membranes with effective reinforced permeation and superior antifouling property that it improves the performance of the oil separation and wastewater treatment.

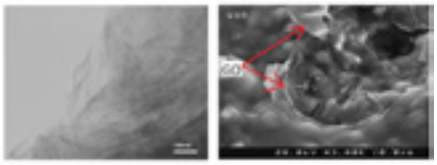

Fig. 1 shows a) TEM image of prepared GO b) SEM image of membrane surface modified PEI-functinalized GO composite

Biography

Zahra Sadeghian is Associate Professor of Materials Science and Engineering. She has received PhD from TU Clausal, Germany in 2005. She has done Post-doctoral Fellowship in Chemical Engineering (membrane process) at RWTH Aachen University in 2010. She is working at Research Institute of Petroleum Industry from 2005. Her expertise is in nanostructured coatings for surface modification and nanomaterial synthesis such as carbon nanotube and graphene and their composites. Also, she has been investigating on ceramic composites in adsorbent, biomaterials, catalysts and membranes applications. She has experiences in oilfield produced wastewater treatment and desalination pilot plant using ceramic membranes and their composites. She has been fabricating ceramic membranes for separation of hydrogen from syngas and other gases.

sadeghianz@ripi.ir

Notes: