ANTI-FOULING MEMBRANES USING GRAPHENE OXIDE

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Abstract

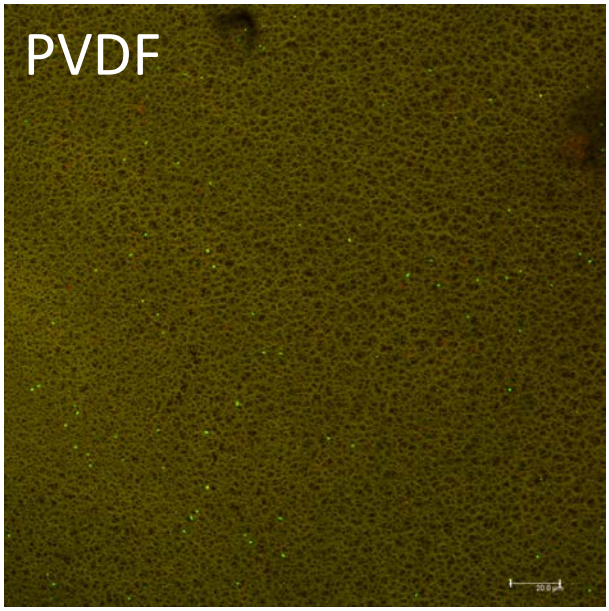
Anti-(bio)fouling is of major interest in many application areas. In the membrane industry it is associated with downtime, use of water and cleaning chemicals and reduction in membrane life.

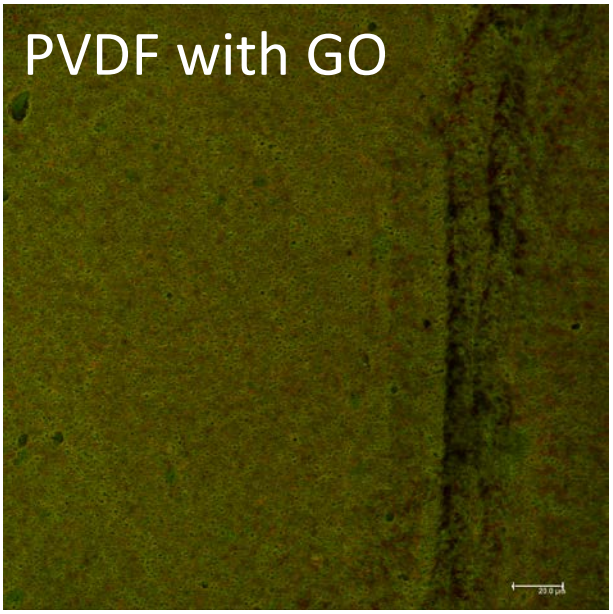
Graphene oxide has been found to have antifouling properties. A new generation of membranes with anti-fouling capability of membranes for water treatment applications has been described using up to 1 wt% of graphene oxide (GO) during the fabrication of the polymer membrane. The membranes have increased hydrophilicity, optimized pore size and mechanical properties, as well as negative Z-potential to reject major fouling component including extracellular polymeric substances (EPS) [1], and microorganisms [2].

In our study we have been investigating 4 different GO or GO derivatives, as well as 2 different types of dispersant/spacers for the GO.

By varying the ratio of GO and dispersant we have found the most promising ratio which we have used for making membranes with different amount of PVDF, aiming at a mean pore size of 0.25 µm. It was shown that the streaming potential for the different membranes was negative above pH 2.5, and decreased with higher pH. The PVDF is highly negatively charged in itself, thus addition of GO or related materials is not important for the charge of these PVDF membranes.

The anti-fouling tests using a confocal laser scanning microscope show that PVDF with GO has less live bacteria on the membrane surface after 6 days exposure of *Pseudomonas aeruginosa, than the PVDF reference*. Below: Live bacteria are shown in green and dead bacteria are shown in red. The membrane appears in yellow/green.





References:
1) Zhao, C., et al.. Desalination, 2014. 340(1): p. 59-66.
2) Lee, J., et al., J. of Membrane Science, 2013. 448: p. 223-230.

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