Marco Laurenti et al., J Material Sci Eng 2017, 6:4(Suppl)
DOI: 10.4172/2169-0022-C1-067

Fabrication of nanoporous graphene membranes for nanofiltration applications

Marco Laurenti, Seifeddine Kara, Marco Fontana, Stefano Bianco, Elena Tresso, Candido Fabrizio Pirri, Sergio Ferrero and **Luciano Scaltrito**
Polytechnic University of Turin, Italy

Nowadays, membrane technology often relies on the use of porous substrates to selectively separate specific compounds from fluids. To improve the separation efficiency and reduce the operating costs, new generation membranes are highly desirable and for numerous applications, like water desalination, oil/water separation as for the isolation and/or extraction of specific biological moieties. A possible solution is to reduce the thickness of the membrane as much as possible. Thanks to their one-atomic-layer thickness coupled with excellent mechanical strength and chemical stability, graphene-based membranes recently gained lots of attention. Several studies showed that graphene with stand strong pressure regimes (up to 57 MPa), while excellent water permeability, high flow rates and promising salt rejection are possible if controlled nanopores are opened within the graphene layer. The present study deals with the fabrication of nanoporous graphene membranes based on CVD-grown monolayer graphene, and porous polycarbonate membranes (PCTE) as supports. Graphene was grown on Cu foils by thermally-activated low-pressure chemical vapor deposition and transferred onto the PCTE supports by following a simple and fast direct transfer procedure. The quality of graphene on Cu foils and PCTE membranes was checked by Raman spectroscopy. After the transfer, FESEM analyses highlighted the good graphene coverage of PCTE, and pointed out the presence of intrinsic graphene defects at the nanoscale. Finally, the water flux and methylene blue (MB) filtration across the nanoporous graphene/PCTE membranes were evaluated in a dead-end cell filtration apparatus. In conclusion, Raman spectroscopy and FESEM analyses confirmed the good quality of monolayer graphene, before and after the transfer process. The presence of intrinsic defects was also observed, allowing for water permeability and molecular selectivity to be obtained. Accordingly, our preliminary results showed that water permeability together with around 90% MB rejection could be obtained for a convenient choice of the polymeric support together with the presence of intrinsic nanopores.

Biography

Marco Laurenti has done his MSc degree in Physical Engineering from the Politecnico di Torino in 2011. In 2015, he received his PhD in Physics at the Politecnico di Torino, in collaboration with the Italian Institute of Technology, Center for Space Human Robotics. He has done his PhD thesis on the deposition and characterization of pristine and doped piezoelectric ZnO thin films by sputtering, for sensing and energy harvesting applications. He is currently working as a Post-doctorate at the Politecnico di Torino. His activities and research interests include the CVD growth of monolayer graphene for the fabrication of nanoporous membranes for water desalination and oil/water separation.

marco.laurenti@polito.it

Notes: