# Graphene/Polymer Composite Membranes for Nano- and Ultrafiltration

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Abstract

Since its discovery in 2004 graphene has experienced a vast amount of interest due to its extraordinary qualities. Besides its unique electronic properties, which have often been in the center of research activities, it also displays exceptional mechanical characteristics making it suitable for novel filtering applications, in particular in areas where until now, track-etched filtering membranes are commonly used [1-2].

Our work aims at combining the advantages of both graphene, in terms of an incomparable high water and gas permeability due to negligible fluid wall interactions, and those of a flexible and mechanical stable polymer support film, resulting in a new graphene/polymer heterostructured membrane type. By irradiating the double-layer membrane with swift heavy ions (SHI) one can simultaneously induce nanometer sized pores with adjustable diameter in the graphene and a perfectly aligned latent track in the polymer. By exposing the polymer to an etching solution, macroscopic pores in the polymer are formed, right beneath the nanometer sized pores in the graphene. Hence, the efficiency and performance of processes such as protein and nanoparticle filtration can be significantly enhanced using nanostructured graphene [3].

References

[1] Surwade et al., Nat. Nanotechn., 10 (2015) 459-464
[2] Shannon et al., Nat., 452 (2008) 301-310
[3] Madauß et al., 2D Mater. 4 (2017) 015034

Figures

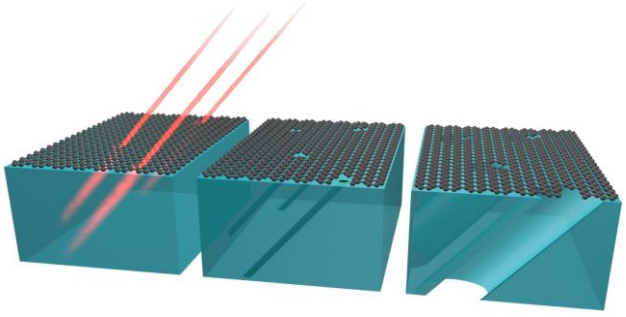

**Figure 1:** Process of swift heavy ion irradiation of graphene/polymer membranes. The nanoscales pores act as the filtering element, whereas the ion damaged tracks in the polymer are etched into large pores.