Synthesis of Antibiofilm Reverse Osmosis Membrane by Modification with Graphene Oxide-Copper Nanocomposites

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This study will focus on the modification of commercial reverse osmosis membrane to impart antibacterial/antibiofilm activity using a nanocomposite of graphene oxide and copper nanoparticles. Copper nanoparticles are of high interest due to their ability to impart antibacterial activity by different mechanisms, such as contact killing (bacterial deactivation by contact with copper surfaces) and toxic copper ion leaching. Importantly, copper has been known to be a catalyst for the reduction of nitrite to form nitric oxide, which is a well known biofilm dispersal signalling molecule (small molecule that could be used as a signal to disperse/detach the biofilm). Incorporation of copper nanoparticles into the membrane matrix is difficult due to nanoparticles aggregation, causing the nanoparticles to easily leached out from the surface. Thus, provision of suitable nucleation site such as graphene oxide that can aid nanoparticles dispersion and stability is required. The synthesis of graphene oxide-copper nanocomposite can be achieved by in-situ formation of copper nanoparticles on commercial graphene oxide. The formed nanocomposite will be subsequently incorporated into commercial polyamide membrane surface using chemical (functionalisation) method. The resulting membrane will be characterised and its overall performance (consisting of antibiofilm activity and water flux performance) will be investigated.