**Recent advance in research on antibacterial polymeric membranes for water treatment**

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Abstract:

Biofouling is a major obstacle to the wide application of membrane based water treatment process. It is caused by attachment and proliferation of water borne bacteria onto the membrane surface. Antibacterial membranes have become emerging solution to prepare highly efficient anti-biofouling membrane, which can be achieved by membrane functionalization with various antibacterial agents. This line of research has attracted huge interest of both academia and industry during the past few years. This review aims to present the up-to-date advances in the preparation and characterization of the antibacterial membranes. Special attention is given to the antibacterial membrane activity assay process and membrane preparation process. In addition, the detailed antibacterial mechanism of the antibacterial agent and the attempt of antibacterial membrane preparation are presented, including inorganic, organic and biocatalytic antibacterial agents. This paper is expected to provide a timely progress report of the antibacterial membrane and to explain the challenges and future prospects of the antibacterial membrane.

1. Introduction.

2. Membrane antibacterial activity assay

3. Antibacterial membranes with inorganic antibacterial agents

 3.1 Preparation of the antibacterial membrane.

 3.1.1 Blending antibacterial agent with polymer membrane

 3.1.2 Coating antibacterial agent on polymer membrane surface

 3.1.3 Interfacial polymerization of antibacterial agent.

 3.2 Antibacterial membrane with silver-based nanomaterials

 3.2.1 The antibacterial mechanism of silver.

 3.2.2 Antibacterial membrane modified with AgNPs.

 3.2.3 Antibacterial agents with silver-based nanocomposites.

 3.3 Antibacterial membrane with graphene-based nanomaterials

 3.3.1 Antibacterial mechanism of graphene-based nanomaterials

 3.3.2 Antibacterial membrane with graphene-based nanomaterials

 3.4 Antibacterial membrane with other inorganic nanomaterials

 3.4.1 Copper based antibacterial agent

 3.4.2 Other metal based antibacterial agent

 3.4.3 Carbon nanotubes (CNTs) based membrane.

4. Antibacterial membranes with organic antibacterial agent.

 4.1 Chitosan

 4.2 Quaternary ammonium salt

 4.3 Polyzwitterions.

 4.4 Capsaicin.

 4.5 Pyridine-based polymers.

 4.6 N-halamine and other organic antibacterial agents

5. Antibacterial membrane modified with bio-enzyme

6. Conclusion and Perspectives