



**Department of Materials Science and Engineering,**

**Candidacy Exam**

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## **Poly(ethylene oxide)-based Polymer Membrane for Reverse-selective Gas Separation**

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In the chemical, metallurgy and petroleum industry, acid gas such as CO<sub>2</sub> are released which is the main cause for global warming. How to effectively and economically separate acid gas from permanent gas such as N<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub> and CH<sub>4</sub> has become a pressing challenge. Compared with the conventional absorption method, polymer membranes provide the advantage of simpler process, less weight and maintenance cost as well as chemically cleanness. Because of the polarity of the ethylene oxide (EO) group and its affinity with acid gas, poly(ethylene oxide) (PEO) is an attractive base material to realize reverse-selective gas separation which is important in industry to avoid energy-intensive recompression process.

In this review, we will talk about the basic gas separation models including diffusion, sorption and permeation from the perspective of molecule structure. Pure PEO, PEO-based block copolymers and PEO-inorganic composites are the three main topics and application examples. Analysis on the increase or decrease of permeability and permselectivity with parameters such as temperature, molecule weight and phase separation will be presented. Comparison with polymer membranes from other family such as glassy polymers will also be discussed.