Crystalline Microporous Materials for Separation and Purification

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Plasma synthesis is a promising technique to prepare variousinorganic and organic materials. However, especially in the synthesis oforganics, numerous species are synthesized and their selectivity is usually notso high. Also, liquid waste is usually generated after this process. Thus,separation and purification must be important to apply in industry.

Crystalline microporous materials are prospectivematerials for adsorbents, catalysts and ion-exchangers. Among them, zeolites,which are composed of tetrahedrally-coordinated silica with Si partiallysubstituted with Al, are interesting materials since they exhibit cationexchange ability, adsorption ability and molecular sieving properties owing tothe negatively charged Al and to their uniform pores of molecular size,respectively. One promising application is adsorbents or membranes for liquid/liquidor gas/gas separation and purification. Zeolites have been appliedas adsorbents for gas dehydration and air separation. Zeolite in the form of membraneshave also been reported to enable separation of numerous liquid/liquid orgas/gas mixtures by their difference in molecular size or affinity. Especially,zeolite membranes are expected to be an environmental friendly separationmethod compared to existing methods such as distillation. Another important application is adsorbents for wastewater treatment. Zeolitesenable removal of hazardous elements or recoveryof valuable elements in wastewater. Recently, complex of zeolites and magneticparticles have received increasing attention as adsorbents for suchapplication. Incorporation of magnetic materials into zeolites enable quickseparation by use of intense magnets.

Inthis presentation, we show potential application of zeolites in the plasmasynthesis process. Synthesis methods and their separation performances forseveral systems will be introduced.