Researchers at the University of South Florida have developed Ag(I) ion functionalized porous organic polymers (POPs), which can separate olefin/paraffin mixtures, such as ethylene/ethane and propylene/propane, in a highly efficient process.

Separations of olefin/paraffin mixtures are very important processes in the chemical industry. For example, ethylene, one of the most widely used feedstock molecules in the petrochemical industry, is usually obtained via steam cracking and thermal decomposition of ethane. The similar molecular sizes and volatilities make the separation of ethylene/ethane mixtures one of the most challenging chemical separations at large scale. Current technologies use cryogenic distillation performed under the conditions of high pressure and low temperature, resulting in an extremely cost and energy intensive process. Extensive efforts to develop low energy approaches for efficient ethylene/ethane separation at higher temperature and normal atmospheric pressure have focused on membrane separation, organic solvent-based sorbents, and porous solid adsorbents. Among these approaches, porous solid adsorbents attract particular interest because of their great potential to afford much lower cost and energy consumption, however, the field is slowly advancing towards the development of efficient adsorbents.

Our inventors have expanded the potential of this field by developing a new type of functionalized porous organic polymers. These Ag(I) ion functionalized POPs were designed through a strategy of incorporating air stable Ag(I) ions into water stable, high surface area POPs for efficient ethylene/ethane separation. The Ag(I) ion functionalized POP of PAF-1 has demonstrated excellent ethylene/ethane selectivity that far outperforms benchmark zeolites and any other molecular organic framework (MOF) reported in literature. This alongside excellent water/air stability, high ethylene uptake capacity, and mild regeneration requirements make Ag(I) ion functionalized POP hold promise as a new platform for highly selective adsorption of ethylene over ethane.

ADVANTAGES:
- High selective absorption of ethylene over ethane
- Excellent water/air stability
- Mild regeneration requirements
- Low cost and energy consumption

New Platform for Highly Selective Absorption

Ag(I) Ion Functionalized Porous Organic Polymer

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