

Polymers of Intrinsic Microporosity (PIMS)

“exceptional promise for separating mixtures of gases and liquids”

At a glance

Many key technological challenges require one kind of chemical molecule to be separated from a mixture. For example, one way to reduce carbon dioxide emissions from power stations is to remove the carbon dioxide from power station flue gases, so it can be stored or used. Another - to ensure that water is safe to drink and that air is safe to breathe - is to detect and remove trace contaminants.

These kinds of molecular separations may involve adsorbents, which selectively take up certain molecules, or membranes, which selectively transport certain molecules. Now, a new type of polymer shows promise to perform both functions....

Novel polymer technology

Peter Budd at Manchester, together with Neil McKeown (now at Cardiff University), developed the concept for a new range of polymers – termed “Polymers of Intrinsic Microporosity” (PIMs) – which combine the ability to adsorb gases and organic vapours with the processability of a polymer.

The ability of the polymer to adsorb and / or transport gas molecules is achieved by both incorporating a “kink” into the polymer backbone AND restricting the degrees of rotation about the backbone.

These two effects when combined restrict the ability of the polymer chains to pack closely together thus generating “intrinsic

microporosity”. In membrane form, this type of polymer shows exceptional promise for separating mixtures of gases and liquids.

Ongoing development

Considerable work has been done and is continuing at Manchester to both scale up the production of the first polymers of intrinsic porosity and develop new PIMs with properties tailored for particular applications.

Exploitation

Given the unique selective gas transport and gas adsorption properties of these novel polymeric materials and the potential application of PIMs for hydrogen storage, separation of carbon dioxide from flue gas / process gas streams and sensor devices, the University of Manchester has filed for patent protection in several countries. A US patent has been granted and a commercial license has been granted.

