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Coordination Polymers from Amine-Based Ligands

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This research has developed amine-based porous coordination polymers (PCPs) as materials for CO₂ capture from coal-fired power plants. PCPs are a class of framework materials built from a combination of organic linkers and metal ions which display a wide range of desirable properties for gas adsorption, including high thermal stability and adjustable chemical functionality. One of the key aims is to improve the adsorption selectivity of PCPs towards CO₂ over other common flue-gas components such as N₂, O₂ and H₂O by incorporating polar amine functionality into the polymer framework.

The use of diethylenetriamine derived ligands has led to the synthesis of a series of three-dimensional coordination polymers. The solid-state structure of each coordination polymer was characterised using single crystal X-ray diffraction at the Australian Synchrotron using the Macromolecular beamlines. These framework materials can be classified as microporous, with the largest pore size observed measuring 9 Å in diameter. Each framework has been tested for thermal stability, with decomposition of the frameworks observed above 300 °C. Adsorption experiments using N₂ at 77 K and CO₂ at 273 K have been performed, with a promising uptake of CO₂ observed.

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