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Pilot-Scale Demonstration of MOF Sorbents: Bridging Materials Innovation and Industrial Carbon Capture

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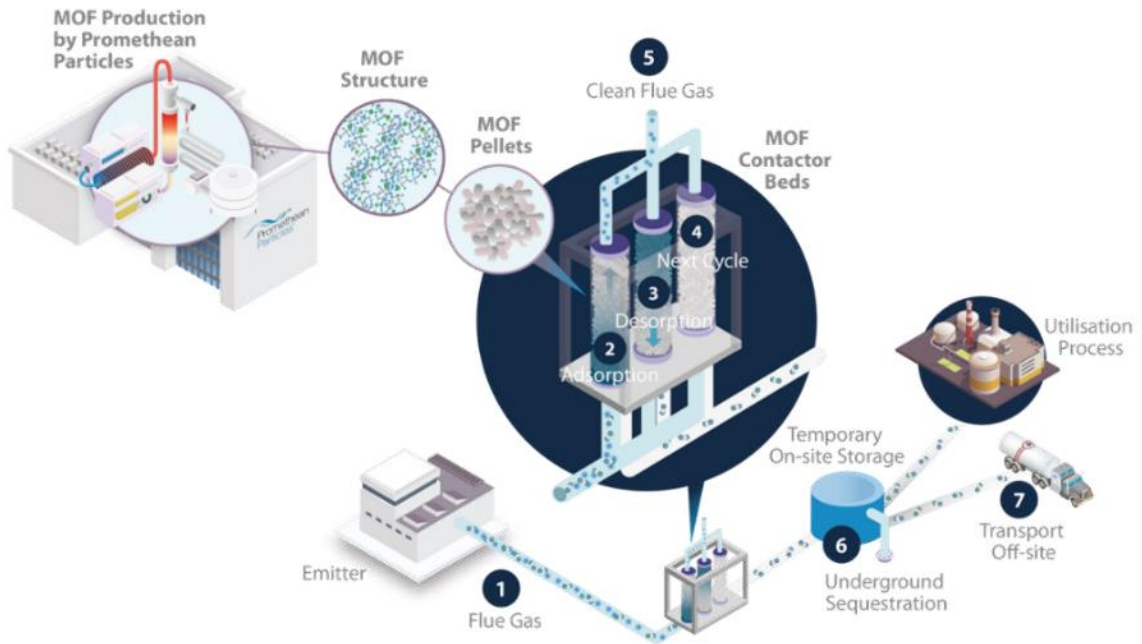
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Abstract

Promethean Particles (“Promethean”) is a UK-based global pioneer, leading the industrial-scale manufacture of metal-organic frameworks (MOFs) – an exciting class of advanced materials showing significant potential for use in carbon capture, water harvesting, and gas storage applications. Their exceptionally high porosity, tuneable chemistry and significant uptake capacities attract attention from a wide range of industries. However, their potential has never been realised due to their low manufacturing volumes and high costs. Promethean is changing this paradigm by utilising its proprietary continuous flow manufacturing technology to produce MOFs at a scale and price point that enables the deployment of MOFs at the industrial scale, and spearheading application development projects to demonstrate the viability of MOFs for industrial use.

This presentation will introduce one such project: MONET (MOF-based Negative Emissions Technology), led by Promethean.¹ This Department of Energy Security and Net Zero funded project supports the development of next generation carbon capture, utilisation, and storage technology within the UK. The project aimed to develop a prototype MOF-based carbon capture and storage (CCS) system and test the efficiency of MOF to capture carbon dioxide (CO₂) from flue gas of an operational power station in the UK. This presentation will highlight the key performance metrics to be considered for using MOFs for carbon capture at pilot scale along with insights into the sorbent behaviour, system integration and operational challenges from the pilot campaigns. It will also highlight the relevance and need for MOF-based carbon capture to meet global decarbonisation goals, and summarise the importance of demonstration projects such as MONET in advancing novel carbon capture technologies towards commercial deployment.

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- [1] Carbon Capture, Usage and Storage (CCUS) Innovation 2.0 competition: Call 2 successful projects - GOV.UK (www.gov.uk)

Keywords: Metal-organic frameworks; next-generation carbon capture; pilot-scale testing; industrial deployment
