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Turning CO₂ from Problem to Resource: The Power of Functional Materials

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Conference Room Orio Zanetto, Alfa Building

Functional materials play a key role in decarbonization strategies by enabling more efficient capture, separation, and utilization of carbon dioxide. Porous materials such as metal-organic frameworks, zeolites, and functionalized sorbents are being developed to selectively adsorb CO₂ from industrial gas streams, contributing to carbon capture technologies. In parallel, advanced membrane materials for gas separation are essential for low-carbon energy systems, particularly for hydrogen technologies, as they allow efficient separation and purification

of H₂ from CO₂ and other gases. In addition, catalytic materials enable the conversion of CO₂ into value-added chemicals, such as methanol, transforming CO₂ from a waste product into a useful feedstock and supporting circular carbon economies. In all these applications, precise control over surface properties and active sites, together with advanced materials characterization, is fundamental to establish structure-activity relationships and to rationally design more efficient functional materials.