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ABSTRACT:

Separation of Hydrogen from Biomass-Derived Syngas Using Polymer Membranes

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Sustainable industrial growth is based on the development of new industrial processes able to solve global important problems like greenhouse gas emissions, energy efficiency and toxic waste. The separation and valorisation of industrial gases with complex composition allows approaching sustainability by means of different routes. Process gases are composed mainly from hydrogen and carbon monoxide, which are identified as major valuable components. Due to its high energy capacity and zero pollutant emissions, H₂ energy is regarded as a good alternative to fossil fuels today. A high-quality, low-cost technology to separate H₂ from multicomponent gases is therefore crucial). Hydrogen can be used as a feedstock, a fuel or an energy carrier and storage, and has many possible applications across industry, transport, power and buildings sectors. The purpose of this work was to determine the effectiveness of newly developed polymer membranes to separate syngas from biomass gasification process into hydrogen rich stream. This talk will also cover the recent research using a small-scale laboratory unit to verify the possibility of hydrogen separation from syngas, with a detailed focus on membrane-based technology. Real-world applications and prospects for scaling these technologies in industrial processes will also be discussed, highlighting their role in advancing green hydrogen production.