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CO2 Summit III: Pathways to Carbon Capture, Utilization, and Storage Deployment

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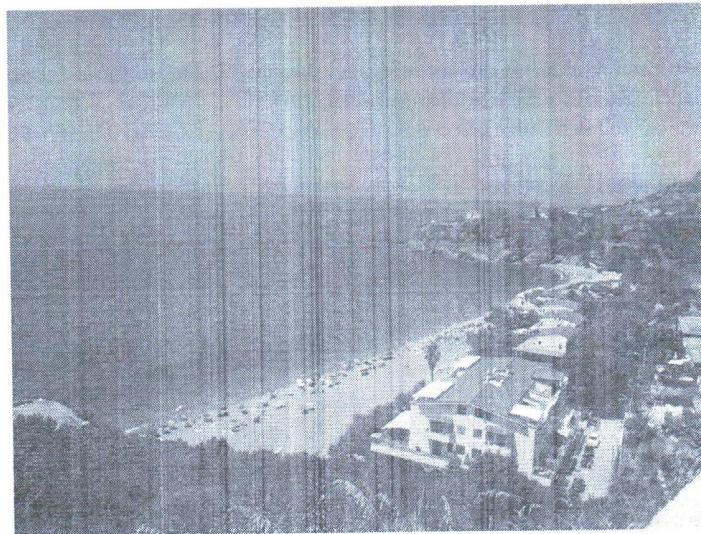
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PHOTOCATALYTIC MEMBRANE REACTOR FOR CO₂ CONVERSION

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Global warming is considered to be one of the principal environmental problems and CO₂, being a greenhouse gas, largely contributes to the global climate change. Owing to this problem, an increasing concern has brought the scientific community to devote huge efforts towards CO₂ reduction and/or valorization through a sustainable process. In this context, photocatalytic membrane technologies can be a promising and innovative way to pursue CO₂ conversion into value-added products.¹ To this purpose, Carbon Nitride (C₃N₄) photocatalyst was prepared and characterized by FTIR and IR-ATR, DRS and XRD analyses. The preliminary reactivity experiments were carried out in a batch reactor (V = 120 mL) filled with humid CO₂ and irradiated in a solar box (65°C). CH₄ and CO were the main reduction products detected. This catalyst was then dispersed to obtain catalytic mixed matrix Nafion membranes. Comprehensive structural and morphological analyses by DRS, FT-IR, ATR-IR, SEM and N₂ and CO₂ permeability measurements were performed. The photocatalytic membranes were then used for the same reaction under UV-Vis irradiation in a membrane reactor operating in continuous mode, as already done with TiO₂-Nafion catalytic membranes². Different H₂O/CO₂ molar ratios and residence times were used. MeOH, EtOH and HCHO were the main products detected. Under the best experimental conditions, methanol and ethanol were identified as the main products with a productivity of 23 and 25 μmol g⁻¹ h⁻¹, respectively.

References.

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