

Effect of Al₂O₃ Phase Transformation in Plasma Catalysis of CH₄ Activation

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Direct methane activation was performed over θ , γ and α Al₂O₃ phase in hybrid plasma-catalytic system using a dielectric barrier discharge (DBD) reactor powered by AC sinusoidal current performed at plasma induced temperature. Phase transformation in Al₂O₃ has negligible effect over CH₄ (10% in Ar) conversion but has significant effect on the selectivity of C₂ hydrocarbons. Using γ Al₂O₃, mesh size of the catalyst ranging 1.70 mm to 0.25 mm was investigated in DBD reactor at 6kV and 3kHz. The conversion of methane on Al₂O₃ catalysts increased as the mesh size of the catalyst decreased. Product distribution of C₂ hydrocarbons was successfully tuned by changing the mesh size of catalysts.