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Abstract

A multilayered ceramic membrane bearing a zirconia separation layer having a nominal pore diameter of 3 nm was modified by chemically grafting a silylated ionic liquid (IL) on the porous zirconia surface and became catalytically active for oxidation of CO by effectively growing ultra-small gold nanoparticles (AuNPs) which served as the active phase supported on the IL-incorporating porous membrane walls. The encompassed IL, which has the property to physically adsorb CO_2 gas strongly and selectively, was immobilized with the purpose to remove produced CO_2 from the reaction zone thereby enhancing conversion of CO. The studied CO oxidation processes were conducted in the flow through configuration. The non-selective membrane essentially served as a convenient means of supporting Au nanoparticles inside the zirconia porous network, which provided highly permeable diffusion paths that minimized the contact time between catalyst phase and reactants and minimized activity loss.