

Modified aluminum phosphate as a methanol dehydration catalyst for direct dimethyl ether(DME) synthesis from syngas

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To develop a catalyst that can directly produce dimethyl ether (DME) from synthesis gas, a series of modified aluminum phosphate samples as a methanol catalyst with various atomic ratio of P/Al (1.0, 1.1, 1.2, 1.3, 1.4, 1.5) were prepared by the precipitation method. The modified aluminum phosphate catalysts were characterized by XRD, NH₃-TPD and BET. The modified aluminum phosphate samples were physically mixed with a methanol synthesis catalyst (CuO-ZnO-Al₂O₃) to form hybrid catalysts for the direct DME synthesis. The direct synthesis of DME from syngas was carried out in a fixed-bed reactor at some temperatures (472, 523, 573 K) under 20 bar and H₂/CO = 2. As a result, the hybrid catalyst in which P/Al ratio of the modified aluminum phosphate was 1.2 showed the highest CO conversion (50%) and DME selectivity (70%) at 523 K and 20 bar.