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Tailoring the properties and catalytic activities of Ni/SBA-15 via different TEOS/P123 mass ratios for CO₂ reforming of CH₄



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ABSTRACT

The influences of tetraethylorthosilicate/triblockcopolymer (TEOS/P123) mass ratios on the properties and catalytic activity of Ni/SBA-15 towards CO₂ reforming of CH₄ were studied. A series of samples with different mass ratios of TEOS/P123 (1.5, 2.21 and 3.0) were prepared and characterized by XRD, BET, SEM, TEM, FTIR and UV–vis DRS. The characterization results clearly indicated that TEOS/P123 mass ratio of 2.21 was the optimal synthesis ratio of Ni/SBA-15 which produces the well-ordered hexagonal mesoporous structure with the highest Ni-support interaction. The catalytically favorable textural properties of Ni/SBA-15(R2.21) enhanced the dispersion of metal particles, improved the catalyst activity, increased the catalyst stability and reduced the carbon deposition. The conversion of CH₄ and CO₂ over Ni/SBA-15(R2.21) were about 89% and 88%, respectively and H₂/CO ratio of 1.02. This study provides new perspectives on the Ni-based catalyst, particularly on the influence of TEOS/P123 mass ratio on the properties and catalytic activity of Ni/SBA-15 towards CO₂ reforming of CH₄.