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研究论文

Preparation of a Nickel Molybdenum Carbide Catalyst and Its Activity in the Dry Reforming of Methane

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摘要 Nickel molybdenum carbide catalysts were prepared and their activities in the CO_2 reforming of methane at a low CO_2/CH_4 reactant ratio were investigated using a microreactor at atmospheric pressure and at 973 K. The effect of the catalyst preparation method and the Ni/Mo ratio on the increase in catalyst life and the promotion of catalytic activity were investigated using N_2 adsorption, X-ray diffraction, temperature-programmed carburization, temperature-programmed reaction, and a reforming reaction. The 25Ni75Mo catalyst that was carburized at 813 K exhibited the highest hydrogen formation ability and gave the least carbon deposition. The incomplete carburization of the Mo oxide species in the catalyst that was carburized at a lower temperature gradually gave a more active carburized species. The $NiMoO_xC_y$ in the catalyst was more active in hydrogen formation during the dry reforming of methane while β-Mo_2C and η-Mo_3C_2 were less active.

关键词： catalyst activation catalyst selectivity fuel dry reforming methane

Abstract： Nickel molybdenum carbide catalysts were prepared and their activities in the CO_2 reforming of methane at a low CO_2/CH_4 reactant ratio were investigated using a microreactor at atmospheric pressure and at 973 K. The effect of the catalyst preparation method and the Ni/Mo ratio on the increase in catalyst life and the promotion of catalytic activity were investigated using N_2 adsorption, X-ray diffraction, temperature-programmed carburization, temperature-programmed reaction, and a reforming reaction. The 25Ni75Mo catalyst that was carburized at 813 K exhibited the highest hydrogen formation ability and gave the least carbon deposition. The incomplete carburization of the Mo oxide species in the catalyst that was carburized at a lower temperature gradually gave a more active carburized species. The $NiMoO_xC_y$ in the catalyst was more active in hydrogen formation during the dry reforming of methane while β-Mo_2C and η-Mo_3C_2 were less active.

Keywords： catalyst activation, catalyst selectivity, fuel, dry reforming, methane

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[1] shcroft A T, Cheetham A K, Green M L H, Vernon P D F. Nature, 1991, 352: 225

[2] agai M, Nakahira K, Ozawa Y, Namiki Y, Suzuki Y. Chem Eng Sci, 2007, 62: 4998

[3] hen X, Honda K, Zhang Z-G. Appl Catal A, 2005, 288: 86

[4] an-José-Alonso D, Juan-Juan J, Illán-Gómez M J, Román- Martínez M C. Appl Catal A, 2009, 371: 54

[5] oh H, Jung Y, Koo K Y, Jung U H, Seo Y, Yoon W L. Appl Catal A, 2009, 383: 156

[6] iu D P, Quek X Y, Cheo W N E, Lau R, Borgna A, Yang Y H. J Catal, 2009, 266: 380

[7] olymosi F, Cserényi J, Szöke A, Bánsági T, Oszkó A. J Catal, 1997, 165: 150

[8] shikawa K, Nagai M, Omi S. J Phys Chem B, 2001, 105: 9124

[9] ominaga H, Nagai M. Appl Catal A, 2007, 328: 35

[10] Oshikawa K, Nagai M, Omi S. Jpn J Appl Phys, 2000, 39: 4456

[11] LaMont D C, Thomson W J. Appl Catal A, 2004, 274: 173

[12] Nagai M, Kanesugi H. J Chem Eng Jpn, 2006, 39: 569

[13] Izhar S, Kanesugi H, Tominaga H, Nagai M. Appl Catal A, 2007, 317: 82

[14] Nagai M, Matsuda K. J Chem Eng Jpn, 2006, 39: 575

[15] Shu Y, Ohnishi R, Ichikawa M. J Catal, 2002, 206: 134

[16] York A P E, Claridge J B, Brungs A J, Tsang S C, Green M L H. Chem Commun, 1997: 39

[17] Brungs A J, York A P E, Claridge J B, Márquez-Alvarez C, Green M L H. Catal Lett, 2000, 70: 117

[18] Lacheen H S, Iglesia E. J Catal, 2005, 230: 173

[19] Matsuo Y, Yoshinaga Y, Sekine Y, Tomishige K, Fujimoto K. Catal Today, 2000, 63: 439

[20] Sehested J, Jacobsen C J H, Rokni S, Rostrup-Nielsen J R. J Catal, 2001, 201: 206

[21] Xiao T, Suhartanto T, York A P E, Sloan J, Green M L H. Appl Catal A, 2003, 253: 225

[1] K. KUMBILIEVA1, L. PETROV2,*, Y. ALHAMED2, A. ALZAHRANI2.Reaction Mechanism and Deactivation Modes of Heterogeneous Catalytic Systems[J]. 催化学报, 2011,32(3): 387-404

[2] Beatriz FIDALGO, J. Angel MENENDEZ*.Carbon Materials as Catalysts for Decomposition and CO_2 Reforming of Methane: A Review[J]. 催化学报, 2011,32(2): 207-216

[3] Ahmed S. A. AL-FATESH, Anis H. FAKEEHA, Ahmed E. ABASAEED.Effects of Selected Promoters on Ni/γ-Al_2O_3 Catalyst Performance in Methane Dry Reforming[J]. 催化学报, 2011,32(10): 1604-1609

[4] Maryam ABDOLRAHMANI;Matin PARVARI*;Mehdi HABIBPOOR.Effect of Copper Substitution and Preparation Methods on the LaMnO3 Structure and Catalysis of Methane Combustion and CO Oxidation[J]. 催化学报, 2010,31(4): 394-403

[5] Alieh KHALESI;Hamid R. ARANDIYAN;Matin PARVARI*.La-Ni-Al钙铁矿氧化物中Sr和Ca取代La对甲醇重整的影响[J]. 催化学报, 2008,29(10): 960-968

[6] G. R. MORADI*, F. KHOSRAVIAN, M. RAHMANZADEH.Effect of Partial Substitution of Ni by Cu in $LaNiO_3$ Perovskite Catalyst for Dry Methane Reforming[J]. 催化学报, 0,(): 0-

[7] Jose M. BERMUDEZ, Beatriz FIDALGO, Ana ARENILLAS, J. Angel MENENDEZ.Mixtures of Steel-Making Slag and Carbons as Catalyst for Microwave-Assisted Dry Reforming of CH4[J]. 催化学报, 0,(): 0-

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