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工程热物理

煤粉热解气还原NO的数值研究

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摘要： 基于详细的化学动力学模型Dagaut机理(1 006个反应，145种组分)，利用Chemkin4.1软件中柱塞流反应器模型模拟了煤粉热解气再燃还原NO的反应过程，揭示了影响热解气还原NO 2种主要因素(温度和当量比)的作用规律，并研究了热解气中含硫组分对NO还原的影响。结果表明：当量比一定时，温度高于1 100 K后不利于热解气还原NO，当量比为1.25时热解气还原NO的最佳温度是1 100 K；温度一定时，随着当量比增加NO还原效率升高，1 200 K时热解气还原NO最佳当量比范围为1.2~1.6，且随着当量比增加反应器中HCN和NH3浓度增大，而N2浓度减少；在模拟的工况中，热解气中的H2S和SO2对NO还原效率的影响不超过5%，且H2S对NO脱除的影响大于SO2。

关键词： 煤热解 NO还原 再燃机理 硫化物 化学反应流动

Simulation Study on NO-reduction by Volatiles From Coal Devolatilization

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Abstract: Study of nitric oxide (NO) reduction process by volatiles from coal devolatilization, based on the detailed chemical kinetic mechanism (1006 reversible reactions and 145 species), was performed in a plug flow reactor (PFR) of the chemical kinetic simulation package Chemkin 4.1 in the simulated reburning conditions. The main process parameters, such as gas temperature and equivalence ratio ware studied and the influences of sulfur contained volatile species on NO reduction were also explored. The PFR simulation results show that, for a given equivalence ratio, reaction temperature higher than 1 100 K does not benefit NO reduction and the optimum temperature is 1 100 K for NO reduction by coal volatiles at equivalence ratio 1.25. For a given temperature, with the increasing of equivalence ratio, NO reduction efficiency increases and HCN and NH3 concentrations also increase while N2 decreasing. The optimum NO reduction range of equivalence ratio is from 1.2 to 1.6 at temperature of 1 200 K. For all tested cases, the effects of H2S and SO2 in volatiles on NO reduction efficiency are less than 5% compared with the tests of no sulfur contained volatile species involved, and H2S has more influences on NO removing efficiency than SO2.

Keywords: coal devolatilization NO reduction reburning mechanism sulfur contained gas species chemically reacting flow

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