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工程热物理

V2O5-WO3/TiO2烟气脱硝催化剂的载体选择

朱崇兵 金保升 仲兆平 李锋 翟俊霞

洁净煤发电及燃烧技术教育部重点实验室(东南大学) 洁净煤发电及燃烧技术教育部重点实验室(东南大学) 洁净煤发电及燃烧技术教育部重点实验室(东南大学) 中电投远达环保工程有限公司 南京工程学院基础部

摘要： 在选择性催化还原试验台上对4种不同TiO2为载体制备的催化剂的脱硝性能进行测试，采用BET、X射线衍射、傅里叶转换红外光谱、扫描电镜-能谱分析、X射线荧光分析和热重分析等技术进行微观表征，并与商业催化剂进行对比。以硫酸法制备的纳米级锐钛型TiO2适合作为选择性催化还原催化剂载体，制备的催化剂脱硝效率高，温度窗口宽，选择性好，其中硫酸盐质量分数为8%~10%时最为有利；以氯化法制备纳米TiO2过程中，生成了V3Ti6O17的聚合物导致NO脱除率较低，因此不适合作为催化剂载体。以工业级TiO2为载体制备的催化剂氨氮比为1.0时，在355~420 ℃的温度范围内NO脱除率为80%~85%，但由于成本很低，因此可以用于脱硝要求不高的场合。由钛酸丁酯溶胶法制备TiO2为载体制备的SCR催化剂性能不及硫酸法制备的纳米级锐钛型TiO2制备的催化剂，且操作复杂，技术难度大，不适宜推广。

关键词： V2O5-WO3/TiO2 催化剂载体 选择性催化还原 烟气脱硝 纳米级锐钛型TiO2

Selection of Carrier for V2O5-WO3/TiO2 De-NOx Catalyst

ZHU Chong-bing JIN Bao-sheng ZHONG Zhao-ping LI Feng ZHAI Jun-xia

Abstract: Four kinds of V2O5-WO3/TiO2 catalysts，based on different TiO2 carriers were prepared. De-NOx performances of the catalysts were studied using bench scale selective catalytical reduction (SCR) reactor and compared with commercial catalyst. Brunauer-Emmett-Teller (BET), X-ray diffractometer (XRD), scanning electron microscope-energy dispersive X-ray (SEM- EDX), Fourier transform infrared spectroscopy (FT-IR), X-ray fluorescence (XRF) and thermo-gravimetric (TG) were employed to investigate the micro structure of the catalysts. The experiment result shows that nano-grade anatase type TiO2 with 8%~10% sulfate, prepared by sulfuric acid method, is suitable for De-NOx SCR catalyst preparation, and shows higher De-NOx activity at broad temperature windows, and good selectivity. The generation of V3Ti6O17 by the nano-grade TiO2, prepared by chloridate method, lowered NO conversion rate and this type of TiO2 is not suitable as the catalyst carrier. NO conversion rate of catalyst based on commercial TiO2 is in the range of 80%~85% at 355~420 ℃, [NH3]/[NO]=0.9~1.0. It can be used for lower De-NOx requirement at lower price. The performance of catalyst base on TiO2 prepared by tetrabutyl orthotitanate sol is not as good as the catalyst base on TiO2 prepared by sulfuric acid method. The manufacturing process is complicated and not suitable for wide application.

Keywords: V2O5-WO3/TiO2 catalyst carrier selective catalytical reduction De-NOx nano-grade anatase TiO2

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通讯作者: 朱崇兵

作者简介:

作者Email: zhucb1978@126.com

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