

# Copper Containing SBA-15 Prepared through pH Modification Method and Its Catalytic Activity for N<sub>2</sub>O Decomposition

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**Abstract** Copper-substituted SBA-15 (Cu/SBA-15) mesoporous materials were directly synthesized under acidic conditions by a "pH modification method" using hexamethylenetetramine (HMTA) as an internal pH-modifier. The synthesized material has been characterized by XRD, SEM-EDX, TEM and FT-IR. The results showed that the resultant materials exhibit highly ordered hexagonal mesoporous structures. In addition, the HMTA also strongly affected the incorporation of copper in the silica framework. During hydrothermal process the HMTA dissociates to release NH<sub>3</sub> and increases the internal pH value and helps to introduce more copper into SBA-15 framework. Catalytic screenings reveal that Cu/SBA-15 materials can be used as potential catalyst for the decomposition of N<sub>2</sub>O. The Cu/SBA-15 (1 : 10) have good catalytic activity causing 50% of N<sub>2</sub>O to decomposed at 600°C.

**Keywords** Cu/SBA-15; hexamethylenetetramine; pH modification; N<sub>2</sub>O decomposition

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## 铜掺杂 SBA-15 的 pH 调节法直接合成及其在 N<sub>2</sub>O 分解反应中的催化性能

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**摘要** 酸性条件下,用环六亚甲基四胺作为 pH 调节剂,采用 pH 调节法直接合成了铜同构替代掺杂的 SBA-15 中孔分子筛(Cu/SBA-15)。采用 X-射线衍射(XRD)、扫描电子显微镜-能量色散 X 射线光谱(SEM-EDX)、透射电子显微镜(TEM)以及傅立叶变换红外光谱(FT-IR)等技术对目标材料进行了表征。结果表明:该材料具有六方中孔有序结构,且环六亚甲基四胺显著影响了铜和 SBA-15 硅骨架的结合,在水热合成过程中,环六亚甲基四胺分解释放出氨气,增加了体系的 pH 值,有助于更多的铜进入到分子筛的骨架中。该材料可用于 N<sub>2</sub>O 分解反应的催化剂,其中 Cu/SBA-15(1 : 10)在 600 °C 下具有优异的催化活性,可分解 50 % N<sub>2</sub>O。

**关键词** 铜掺杂 SBA-15;环六亚甲基四胺;pH 调节法;N<sub>2</sub>O 分解反应

Nitrous oxide is considered an environmental pollutant because it is a relatively strong greenhouse effect gas and contributes towards the destruction of ozone in the stratosphere. The continuous increase of

its concentration, due to both natural and anthropogenic sources and its long atmospheric residence time (about 150 years), requires the development of efficient solutions for its abatement.

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