

催化、动力学与反应器

## 流化床与固定床中甲烷裂解制氢过程的比较

刘少文, 李永丹

天津市应用催化科学与工程重点实验室, 天津大学化工学院

收稿日期 2006-5-9 修回日期 2006-11-14 网络版发布日期 2007-1-10 接受日期

**摘要** 本文对流化床与固定床操作模式下的甲烷催化裂解制氢进行了比较研究。以纯甲烷为原料, 分别考察了75Ni10Cu15Al和2Co1Al (原子比) 催化剂上流化床与固定床操作模式下甲烷裂解制氢反应, 结果表明流化床中的甲烷裂解反应速率较高。流化床操作的高表观速率主要是因为此模式下有效消除了外扩散, 同时极大减少了内扩散阻力。同时不同温度下催化剂上生长的碳的TEM表征发现, 金属颗粒尺寸随反应温度增加而增加, 表明催化剂烧结是失活原因之一。但相同温度下固定床中催化剂金属颗粒尺寸明显大于流化床中的金属颗粒尺寸, 且金属颗粒尺寸分布变宽, 这说明流化床反应器有利于阻止金属颗粒的烧结。通过对甲烷裂解催化剂失活原因的分析发现流化床中催化剂颗粒的流态化有利于延长催化剂活性寿命。

**关键词** [甲烷裂解](#) [制氢](#) [反应器](#) [流态化](#) [碳生长](#)

分类号

## Comparison of fluidized and fixed bed operations for hydrogen production from methane decomposition

LIU Shaowen, LI Yongdan

### Abstract

The effect of reaction modes, i.e. fluidized bed and fixed bed operations, on catalyst life for hydrogen production from methane decomposition was investigated over a 75Ni15Cu10Al catalyst and a 2Co1Al catalyst. Pure methane was used as the feed. The results showed that the apparent reaction rate in the fluidized bed was much higher than that in the fixed bed, indicating that in the fixed bed the reaction was transport-controlled. The carbon formed was characterized with TEM technique, and the results showed that the size of metal particles increased with rising reaction temperature, and at the same reaction temperature the size of metal particles on the catalyst in the fixed bed was larger than that on the catalyst in the fluidized bed, signifying that fluidized bed reactor is beneficial to preventing the sintering of active metals.

**Key words** [methane decomposition](#) [hydrogen production](#) [reactor](#) [fluidization](#) [carbon growth](#)

DOI:

通讯作者 刘少文 [shaowenl@163.com](mailto:shaowenl@163.com)

### 扩展功能

#### 本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(1217KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [参考文献](#)

#### 服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

#### 相关信息

- ▶ 本刊中 包含“[甲烷裂解](#)”的 [相关文章](#)
- ▶ 本文作者相关文章

- [刘少文](#)
- [李永丹](#)