中国化学工程学报 2006 14 (5): 642-648 ISSN: 1004-616x CN: 44-1063/R

PROCESS AND PRODUCT TECHNOLOGY

低温水相一步合成钛酸钡，颗粒合成研究

沈志刚[a,b],张维维[a],陈建峰[a],魏崇礼[b]

[a] Sin-China Nano Technology Center, Key Lab for Nanomaterials, Ministry of Education, Beijing University of Chemical Technology, Beijing 100029, China [b] NanoMaterials Technology Pte Ltd, Blk 28 Ayer Rajah Crescent #03-03, Singapore 139959, Singapore

收稿日期 修回日期 网络版发布日期 接受日期

摘要 The formation of BaTiO3 nanoparticles via the reaction of BaCl2, TiCl4 and NaOH in aqueous solution has been systematically studied. The formation of BaTiO3 from the ionic precursors has been elucidated to be a very rapid process, occurring at temperature higher than 60℃. Furthermore, the particle size could be controlled by the proper selection of the synthesis conditions (e.g. reactant concentration of 0.5—1.0mol•L−1, temperature of 80— 95℃ and pH≥13). A two-step precipitation mechanism was proposed. The first stage of the synthesis involved the formation of amorphous Ti-rich gel phase. The second stage of the synthesis was the reaction between the amor-phous phase and the solution-based Ba2+ ions, which led to the crystallization of BaTiO3. Based on the particle for-
mation mechanism, a novel method, high gravity reactive precipitation, was proposed and used to mass production of BaTiO3 of average particle size of about 60 nm and with narrow particle size distribution. Because it could break up the amorphous Ti-rich gel into small pieces, intensify mass transfer, promote the reaction rate of amorphous Ti-rich gel with Ba2+ ions.

关键词 nanoparticles synthesis, particle formation mechanism, barium titanate, perovskite phase, high gravity reactive precipitation.
分类号
**DOI:**

**Low Temperature One Step Synthesis of Barium Titanate: Particle Formation Mechanism and Large-scale Synthesis**

SHENZhigang[a,b], ZHANGWeiwei[a], CHENJianfeng[a], JimmyYun[b]

[a] Sin-China Nano Technology Center, Key Lab for Nanomaterials, Ministry of Education, Beijing University of Chemical Technology, Beijing 100029, China

[b] NanoMaterials Technology Pte Ltd, Blk 28 Ayer Rajah Crescent #03-03, Singapore 139959, Singapore

Received Revised Online Accepted

**Abstract** The formation of BaTiO3 nanoparticles via the reaction of BaCl2, TiCl4 and NaOH in aqueous solution has been systematically studied. The formation of BaTiO3 from the ionic precursors has been elucidated to be a very rapid process, occurring at temperature higher than 60℃. Furthermore, the particle size could be controlled by the proper selection of the synthesis conditions (e.g. reactant concentration of 0.5—1.0mol•L−1, temperature of 80— 95℃ and pH≥13). A two-step precipitation mechanism was proposed. The first stage of the synthesis involved the formation of amorphous Ti-rich gel phase. The second stage of the synthesis was the reaction between the amor-phous phase and the solution-based Ba2+ ions, which led to the crystallization of BaTiO3. Based on the particle for-
mation mechanism, a novel method, high gravity reactive precipitation, was proposed and used to mass production of BaTiO3 of average particle size of about 60 nm and with narrow particle size distribution. Because it could break up the amorphous Ti-rich gel into small pieces, intensify mass transfer, promote the reaction rate of amorphous Ti-rich gel with Ba2+ ions.

**Key words** nanoparticles synthesis; particle formation mechanism; barium titanate; perovskite phase; high gravity reactive precipitation.

通讯作者:
沈志刚 chenjf@mail.buct.edu.cn
作者个人主页: 沈志刚[a,b];张维维[a];陈建峰[a];魏崇礼[b]

扩展功能
本文信息
Supporting info
PDF(796KB)
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
引用本文
Email Alert
文章反馈
浏览反馈信息
相关信息
本刊中 包含“nanoparticles synthesis”的 相关文章
本文作者相关文章
· 沈志刚
· 张
· 张维维
· 陈建峰
· 魏崇礼