

论文

氯化铵对TiO₂纳米晶的形成、结构及性能的影响

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摘要:

以四氯化钛为原料, 通过氯化铵诱导晶化和热挥发分解法制备了二氧化钛纳米晶, 经粉末XRD, TEM, IR和比表面积及热重分析等手段进行了表征. 通过对粒子生长动力学分析, 在700 °C以下存在两种生长势, 400 °C时出现转折, 400 °C以下粒子生长所需活化能为8.23 kJ/mol; 400 °C以上粒子生长需活化能为45.71 kJ/mol. 于200 °C时灼烧样品的表面积最大, 对甲基橙光催化降解活性最高.

关键词: TiO₂; 氯化铵; 纳米材料; 粒子生长动力学

Influence of NH₄Cl on Formation, Structure and Properties of Titania Nanocrystals

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Abstract:

TiO₂ nanocrystals were synthesized by the method of volatilization and decomposition of TiCl₄ in the existence of NH₄Cl. The influence of NH₄Cl on the structure of crystalline phase and the properties of the sample was discussed. The samples were characterized by XRD, TEM, IR, specific surface areas and thermal analysis. The samples completely changed to anatase phase and are nanocrystals with a diameter less than 7 nm by calcination at 150 °C for 5 h; the samples calcined at 300-600 °C with the particle diameter about 9-23 nm are composed of pure anatase TiO₂; the samples calcined at 700 °C with the particle diameter of about 33 nm are composed of a large quantity of anatase phase and a little amount of rutile phase. By dynamics analysis of crystal growth, calcination below 700 °C, there are two kinds of driving power to crystal growth, and 400 °C is the turning point: calcination below 400 °C the required energy of crystal growth is 8.23 kJ/mol; calcination at above 400 °C the required energy of crystal growth is 45.71 kJ/mol. The catalytic activity of the samples calcined at 200 °C, which had the largest specific surface area and the particle diameter is about 7 nm, are the highest in the reaction of methyl orange decomposition.

Keywords: TiO₂; NH₄Cl; Nanomaterials; Kinetics of particle growth

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