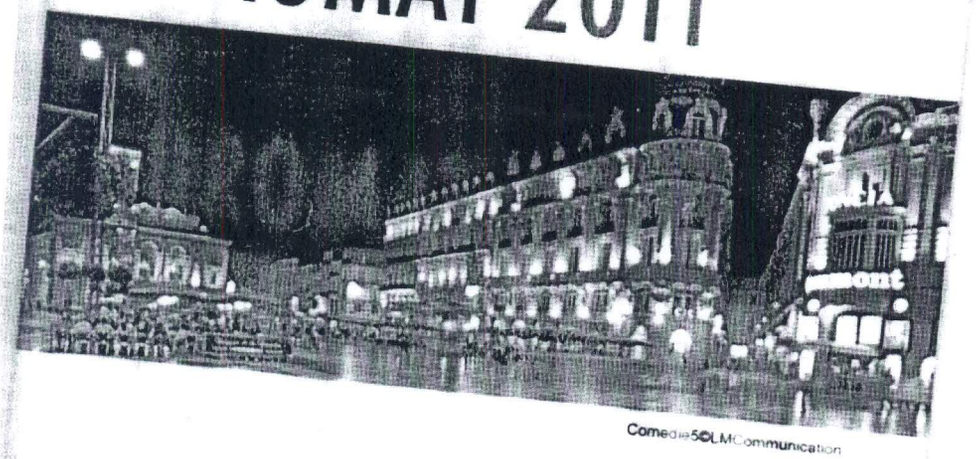
EUROMAT 2011

FEMS



Comedia SOLMCommunication

European Congress
on Advanced Materials and Processes

12-15 September 2011

Montpellier, France

SF2M
Société Française
de Métallurgie et de Matériaux

AIM
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di Metallurgia

Main Topics

Functional Materials: Properties & Applications
Magnetic Materials; Materials for Nanostructures; Functional Polymeric Materials; MEMS, NEMS and Devices

Structural Materials: Properties & Applications
Advanced Metals; Advanced Ceramics; Hybrid and Composite Materials; Advanced Concepts in Structural Materials

Materials Processing
Solidification and Solid State Transformations; Joining; Powder Routes: from Synthesis to Materials; Coatings and Surface Engineering; New concepts in Materials Processing

Characterisation and Modeling
Microstructural Characterisation Techniques; Mechanical Characterisation Techniques ; Materials Modeling on all Length Scales

Energy and related Applications
Energy Production, Transportation and Management; Materials for Energy in a Sustainable Society; Materials for Transportation

Health Care Applications
Materials for Health Care Applications

Education

Topic Area C Processing
Topic C3 - Powder routes : from synthesis to materials C31-O-4-5
Symposium C31 - Powder Synthesis and Processing **2444**
Session Ceramic powders synthesis II

Synthesis of morphologically different TiO2-anatase and the study of its photocatalytic properties.

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Abstract

In studies on the influence of the nanocrystals morphology on its photocatalytic properties, it is important to consider the historical of the material, like the synthesis process.[1] This paper proposes to investigate the influence of the synthesis process on the photoactivity of morphologically different TiO2 nanocrystals obtained by hydrothermal treatment of amorphous powder at different pH conditions.[2,3] Photoactivity of the samples was studied by the degradation of Rhodamine b (RhB) dye under UVC radiation. Nanocrystals were synthesized at pH 6, 8 and 10, which resulted in anisotropic materials, because of the oriented crystal growth with pH increase, and consequent decrease of specific surface area. Only TiO2-anatase was obtained. Analysis by Zeta potential showed higher surface hydroxylation to the samples synthesized at higher pH values, which is favorable to photocatalysis. Photodegradation trials showed the strong influence of morphology on the photoactivity of the material. The trials also showed that synthesis performed at pH value around 8 generated materials with higher photoactivities than at other pH values. The transformation of isotropic structures (pH 6 and 8) to anisotropic (pH 10) leads to a decrease in the photoactivity of the material, even the last one having a higher surface hydroxylation. One of the factors that lead to decrease in photoactivity is the decrease in specific surface area, however this is not the only factor. Photoluminescence spectroscopy showed relation with synthesis pH. Anisotropic crystal growth generated a decrease in spectra intensity. It was because of defects that coming from crystal growth. These defects act as recombination centers of photogenerated charges during photocatalytic process, leading to a non-radiative decay and preventing electrons and holes responsible for the photocatalytic process to reach the surface, resulting in a decrease in photoactivity materials synthesized at higher pH values, even those possessing a higher surface hydroxylation.

1- W.Y. Teoh, F. Denny, R. Amal, D. Friedmann, L. Madler, S.E. Pratsinis, Top. Catal. 44 (2007) 489.

2- C. Ribeiro, C.M. Barrado, E.R. Camargo, E. Longo, E.R. Leite, Chemistry - A European Journal 15 (2009) 2217.

3- S. Han, S.H. Choi, S.S. Kim, M. Cho, B. Jang, D.Y. Kim, J. Yoon, T. Hyeon, Small 1 (2005) 812.