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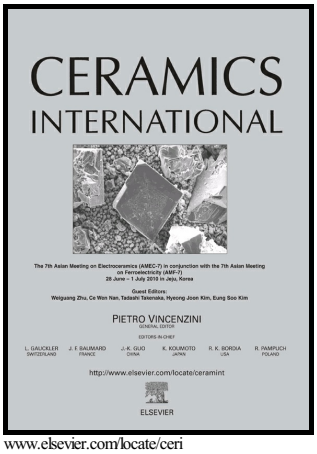

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PII: S0272-8842(17)32297-6
DOI: https://doi.org/10.1016/j.ceramint.2017.10.109
Reference: CERI16528

To appear in: *Ceramics International*

Received date: 4 March 2017
Revised date: 21 August 2017
Accepted date: 17 October 2017

Cite this article as: Tong Lin, Maoying Liao, Siwei Zhao, Haowen Fan and Xufei Zhu, Anodic TiO_2 nanotubes produced under atmospheric pressure and in vacuum conditions, *Ceramics International,* https://doi.org/10.1016/j.ceramint.2017.10.109

Anodic TiO_2 nanotubes produced under atmospheric pressure and in vacuum conditions

Tong Lin, Maoying Liao, Siwei Zhao, Haowen Fan, Xufei Zhu*

Key Laboratory of Soft Chemistry and Functional Materials of Education Ministry, Nanjing University of Science and Technology, Nanjing 210094, China.

* Corresponding author. Tel.: +86-25-84315949

E-mail addresses: zhuxufei.njust@163.com (X. Zhu)

Abstract

Throughout the intense research of anodic TiO_2 nanotubes (ATNTs), the effect of ambient pressure is usually ignored. In this article, Ti foils were potentiostatically anodized both under atmospheric pressure (0.1 MPa) and in vacuum (0.005 MPa). The anodizing current and nanotube length in vacuum are larger than those under atmospheric pressure, which cannot be explained by field-assisted dissolution theory. According to the oxygen bubble mould and Nernst equation, we attribute the higher current in vacuum to the faster gas evolution and oxide growth under narrower electrochemical potential gaps. By mathematically separating the total current into ionic and electronic parts, the faster oxide growth is further confirmed. The different nanotube lengths are due to various electric charge transported during anodization.

Keywords: A. Films, C. Ionic conductivity, D. TiO_2 nanotubes