



Contribution ID: 440

Type: **Poster Presentation**

TiO₂ Nanorods Formation Mechanism on Ti Foil Substrate by Gel-Oxidation Method

Wednesday, 5 July 2017 17:10 (1h 50m)

Gel-oxidation method is a thermochemical method used to modify and form surface layers on Ti surface by controlling the thickness and morphology of surfaces. It can be described in terms of the following two-step process: (i) gelation: a Titanium based hydrogel is formed on Ti surface from corrosive reagent such as NaOH, KOH, LiOH, H₂O₂, ...; and (ii) oxidation: the hydrogel is oxidised at various temperatures, thereby forming a surface layer of recrystallized titania (TiO₂) and possibly other phases, such as alkaline (Na, ...) titanate, on the surface [1] [2] [3] [4]. Hence, the aim of the present investigation is to explore the formation mechanism that leads to the synthesis of TiO₂ nanorods on metallic substrate, in particular Ti foil surface by gel-oxidation NaOH based method.

From XRD, SEM, TEM and Raman spectroscopy investigations, the following observations were made: (1) On the surface of Ti foil treated in 5 M NaOH solution at 76 °C for 24 h, there is a porous network morphology made of predominantly amorphous with a small amount of nanocrystalline; (2) anatase and rutile TiO₂ nanorods formation take place on the surface of NaOH-treated Ti foil calcinated (oxidised) at 600 and 800 °C under a N₂ flow; (3) rutile TiO₂ nanostructures formation take place efficiently on the surface of NaOH-treated Ti foil calcinated (oxidised) at 800 °C under a N₂ flow. After a careful interpretation of above results, it is understood that TiO₂ fabricated nanorods inherited their morphology from Na Titanates.

References

- [1] H.Z. Abdullah, P. Koshy and C.C. Sorrell, "Gel Oxidation of Titanium for Biomedical Application," Adv. Mater. Res., vol. 620, p. 122, 2013.
- [2] H.Z. Abdullah and C.C. Sorrell, "Gel Oxidation Of Titanium And Effect Of UV Irradiation On Precipitation Of Hydroxyapatite From Simulated Body Fluid," Advanced Materials Research, Vols. 488-489, p. 1229, 2012.
- [3] Hyun-Min Kim, F. Miyaji, T.Kokubo, and T. Nakamura, "Preparation of bioactive Ti and its alloys via simple chemical surface treatment," J. Biomed. Mater. Res., vol. 32, p. 409, 1996.

Apply to be considered for a student award (Yes / No)?

No

Level for award (Hons, MSc, PhD, N/A)?

N/A

Main supervisor (name and email) and his / her institution

J.R. Botha, , Nelson Mandela Metropolitan University

Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

No

Primary author: Mr MBULANGA, Crispin (Nelson Mandela Metropolitan University)

Co-author: Mr TANKIO DJIOKAP, Stive Roussel (Nelson Mandela Metropolitan University)

Presenter: Mr MBULANGA, Crispin (Nelson Mandela Metropolitan University)

Session Classification: Poster Session 2

Track Classification: Track A - Division for Physics of Condensed Matter and Materials