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

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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 oC 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 oC under a N₂ flow; (3) rutile TiO₂ nanostructures formation take place efficiently on the surface of NaOH-treated Ti foil calcinated (oxidised) at 800 oC 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

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

No

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

N/A

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

No

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