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Controlled spacing of self-organized anodic TiO₂ nanotubes

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Abstract

We report on how to grow and control self-organized TiO₂ nanotube arrays that show defined and regular gaps between individual nanotubes. For this we use electrochemical anodization of titanium in fluoride containing diethylene glycol (DEG) electrolytes, with variations in voltage and water content in the electrolyte. In these specific electrolytes, such nanotubes show a true spacing, i.e. nanotubes are spaced both at top and at bottom in regular intervals, this in contrast to classic nanotubes obtained in other organic electrolytes showing a close-packed organization. We identify critical parameters that define the "region of existence" i.e. under which condition tube spacing occurs as well as the intertube distance, to be the voltage and the water content. Using these findings allows to grow tubes where diameter and spacing can even be independently controlled. (C) 2016 Elsevier B.V. All rights reserved.

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Author Keywords: Spaced TiO₂ nanotubes; Anodization; TiO₂ arrays

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