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U.S. DEPARTMENT OF ENERGY | Office of Science

Nanoforest Photoanodes for Photoelectro-chemical Cells by Pulsed Laser Deposition

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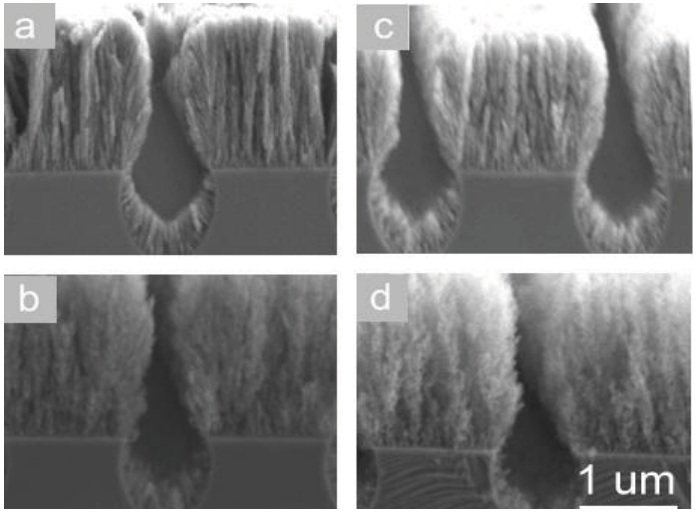
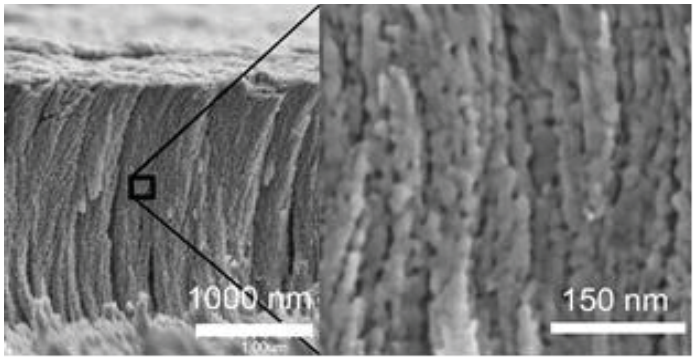


Nb2O5 forest grown on a patterned substrate by pulse laser ablation under an oxygen background. Surface area directly controlled by target substrate distance, a) 50 mm, b) 62 mm, c) 74 mm, and d) 88 mm



Cross section of our Anatase TiO_2 film growth by Pulse Laser deposition approach

Nanoforest structure for oxide semiconductors photoanodes for full control of surface and electronic properties

✓***Achievement***: We have developed a new fabrication method that inspired on a forest structure assembles the nanocrystals with a preferential vertical arrangement. The figures shows the unique structure that can be tailored for TiO_2, Nb_2O_5, $SrTiO_3$ and several other oxides. The method is a robust physical approach that is realized using pulse laser deposition.

✓ ***Significance***: Contrary to conventional sol-gel techniques were nanocrystals are assembled in a random fashion, this new nanostructure presents a hierarchical structure comparable to that of a living tree, which in principle should be able to transport electronic charge more efficiently without loosing surface area as is common in nanorod approaches.

Rene Lopez, Edward T. Samulski, Thomas J. Meyer, M. Kyle Brennaman, Laurie E. McNeil, Myoung-Ryul Ok, Tim Uher and Rudresh Ghosh, "Nanoforest Nb_2O_5 Photoanodes for Dye sensitized Solar Cells by Pulsed Laser Deposition," ACS Applied Materials & Interfaces, **2011**, submitted

SOLAR FUELS & NEXT GENERATION PHOTOVOLTAICS

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