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Anodic Oxide Nanotubes for Energy Conversion and Storage: Current Status and Future Direction

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Nanotubular configuration of oxides offers several advantages over its bulk counterparts including large specific surface area, better electronic conductivity, ability to accommodate large strain, and enhanced catalytic activity for certain chemical and electrochemical reactions. There are several methods available for synthesis of oxide nanotubes. This presentation will focus on preparation of ordered arrays of transition metal oxide nanotubes using a facile electrochemical anodization technique. Defect chemistry of anodic oxide nanotubes could be modulated using the process parameters in order to achieve desired electrical and magnetic properties. These oxide nanotubes are active electrode materials for energy conversion and storage applications such as photo water splitting, dye sensitized solar cells, conversion of CO2 into useful hydrocarbons, and electrochemical supercapacitors. This presentation will discuss the issues that limit the performance of the oxide nanotubes and suggest future directions to overcome such limitations.