

Abstract Submitted
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Titanium oxide nano-clusters prepared via amorphous solid water: Improved overlap with solar spectrum MICHA ASSCHER, The Hebrew University of Jerusalem — The need to develop reliable and cost effective alternative energy sources is rapidly growing. Solar light is among the most important and promising, therefore new materials are searched for to effectively overlap and harvest the solar spectrum. Here we describe the preparation of titanium oxide nano-clusters utilizing amorphous solid water (ASW) as a reactive buffer layer to assist the growth of titanium oxide clusters. These clusters were grown in-vacuum on top of ASW layers at 120K. Upon evaporation of the water layer, seed $\text{Ti}(\text{OH})_n$ clusters polymerize via a solid state “Sol-Gel-like” mechanism. Self termination process, dictated by the evaporated water vapor, results in hemispherical clusters 5-7 nm in diameter. The clusters were analyzed by XPS at 300K. The clusters grown this way were studied by employing 4K scanning tunneling spectroscopy, revealing a typical diode-like I-V profile. An apparent band gap of 2.3 ± 0.5 eV was obtained, significantly narrower than the bulk value of TiO_2 crystal (3.2 eV). Thermal stability of these defect rich clusters need to be studied, since this may prove important for photo-catalysis and photovoltaic applications.

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