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Licensing Opportunity

Ultra-Fast Sintering Process for Metal Oxide Thin Films

Thin films of metal oxide nanoparticles deposited on substrates find applications in various technologies such as sensors, heterogeneous catalytic systems, dye-sensitized solar cells, and other advanced thin film applications.

A draw-back linked to these materials is the need for sintering at elevated temperatures (above 400°C) to render them functional as films, both mechanically and electronically. Traditional sintering processes involve long exposure times (hours) to elevated temperatures in convection oven, which restrict the choice of substrates (metal, glass) and can negatively affects their performances (stress induction, oxidation, substrate warping).

Markets & Industries

Companies involved in the development of Dye-Sensitized Solar Cells (According to IDTechEX, this segment of the Photovoltaic market will grow to $290M by 2023), sensors, heterogeneous catalysis, and other advanced thin film technologies.

Technology Description

UCD's new sintering technology relies on microwave plasma energy to heat and sinter materials from within, and under a controlled atmosphere. Selective doping during the process to further improve the nanostructured film performance has also been demonstrated.

Technology Status

Reduced to practice with traditional undoped and *in-situ* carbon-doped TiO_2 films for DSSC applications, as well as NiO thin films. Likely to be applicable to other materials and applications.

Publication: Binh H.Q. Dang, Mahfujur Rahman, Don MacElroy, Denis P. Dowling, Evaluation of microwave plasma oxidation treatments for the fabrication of photoactive un-doped and carbon-doped TiO_2 coatings, *Surface & Coatings Technology* (2012), doi: 10.1016/j.surfcoat.2012.04.003

VALUE PROPOSITION

This novel process offers key advantages over currently available solutions:

- Fast process throughput (less than 10 minutes), compared to 4+ hours in traditional ovens (including ramp up & down)
- Delivers equal or superior optoelectronic properties of DSSC thin films.
- Enables processing of nanomaterials on temperature-sensitive substrates such as ITO glass, and various plastic substrates.

IP STATUS

European, USA and Chinese Patent Applications focused on the DSSC application, published as WO/2012/032092 on 15/03/2012.

C-doping focused PCT Patent Application PCT/IB2013/055490 published as WO 2014/006590

OPPORTUNITY

Evaluation & Licensing Opportunity.

INVENTORS

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