International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

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High crystalline TiO_2 & ZrO_2 nanoparticles for Photovoltaic and Self-cleaning applications

Overview

In recent years, there has been increasing interest in the application of nanoparticles in various fields because of its large effective area which enhances the surface reactions. Titanium dioxide (TiO_2) & Zirconium dioxide (ZrO_2) are the most important industrial materials that have been used for white pigments for a long time owing to its high refraction characteristic. Further, it is one of the main components of piezoelectric materials, dielectrics, and semi-conductors according to the development of electronic industry since it is characterized by a high dielectric constant. Still further, it has been the trend recently that its application to cosmetics, fillers, paints, lubricants, precision ceramics, anodic materials (DSSC and Perovskite, battery, etc.) functional coatings (Antireflective, corrosion protection, barrier layers, etc.) and using UV shielding and absorbance properties as well as a catalyst for removing organic contaminants according to the chemical corrosion resistance and photocatalytic effect has been extended rapidly. To view of the vast applications, the primary objective of this project work is to focus to develop highly crystalline TiO_2 and ZrO_2 nanoparticles along with high dispersion and uniformity suitable for the above mentioned applications.

Key Feature

- High crystalline
- Uniform particle size
- Good dispersion in polar solvents
- High photocatalytic property
- Easily incorporate into any type of device/ object

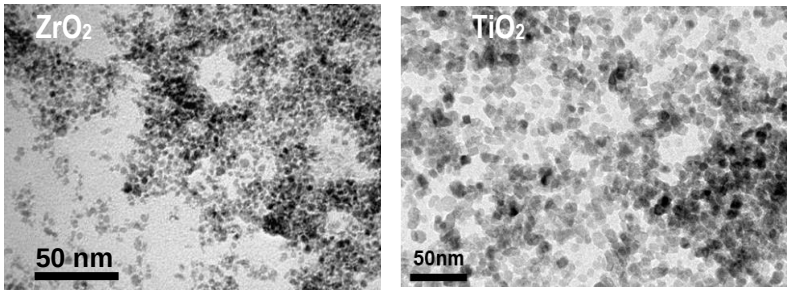
Potential Applications

- Photoanodes for DSSC and Perovskite solar cells
- Self-clean fabrics/ceramic tiles and glass manufacturing
- Coatings for corrosion resistance and barrier applications

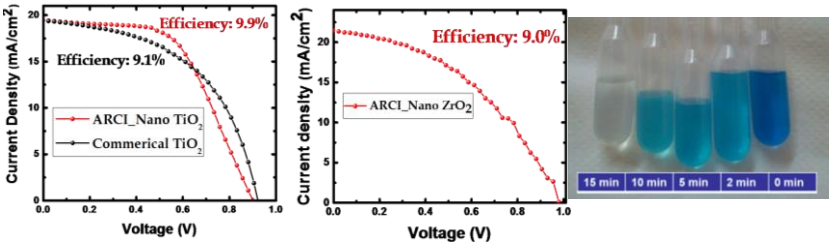
Current status

- Crystalline TiO_2 and ZrO_2 nanoparticles have been successfully developed by lyothermal synthesis & investigated photovoltaic and photo catalytic properties of the materials.

TEM morphology of ZrO_2 & TiO_2 nanoparticles



Photovoltaic and Photocatalytic performance of TiO_2 and ZrO_2 nanoparticles



Outcome/Expected outcome:

- Highly dispersible crystalline nanoparticles were successfully developed & validated for solar cell and photocatalytic self-cleaning

IPDI*	1	2	3	4	5	6	7	8	9	10
Status										

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