

Nano-Enabled TiO₂ UV Protective Layer for Cool-Color Roofing Application

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DOE PHASE II SBIR GRANT No. DE-SC0003737

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Phase II End Date: Aug 31, 2012

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Phase II Program Summary



❖ Objectives

- Optimize and scale up SiO_2 coated TiO_2 ($\text{SiO}_2 @\text{TiO}_2$) nanocrystal synthesis and functionalization in aqueous solution to formulate 10 gallon waterborne clear UV protective nanocomposite coating material
- Evaluate developed coatings on aluminum for cool roof applications
- Establish environmental requirements for the proposed UV protective coatings

❖ Scope of Work

- Establish environmental requirements
- Synthesis of $\text{SiO}_2 @\text{TiO}_2$ nanocrystals
- UV testing
- Nanocomposite film optimization
- Optimize the spray coating processes
- Scale up $\text{SiO}_2 @\text{TiO}_2$ nanocrystal synthesis and functionalization in aqueous solution
- 10 gallon nanocomposite coating material formulations
- Shelf life and UV exposure testing

❖ Cost of project

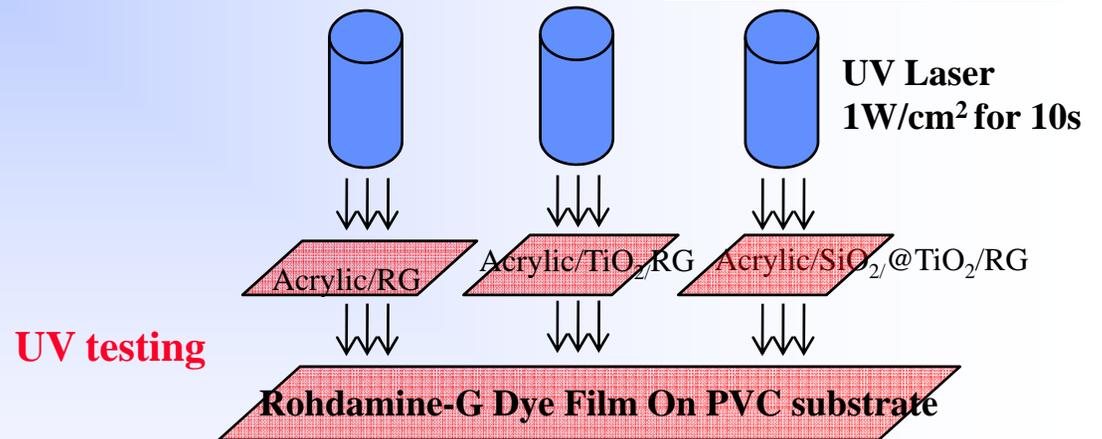
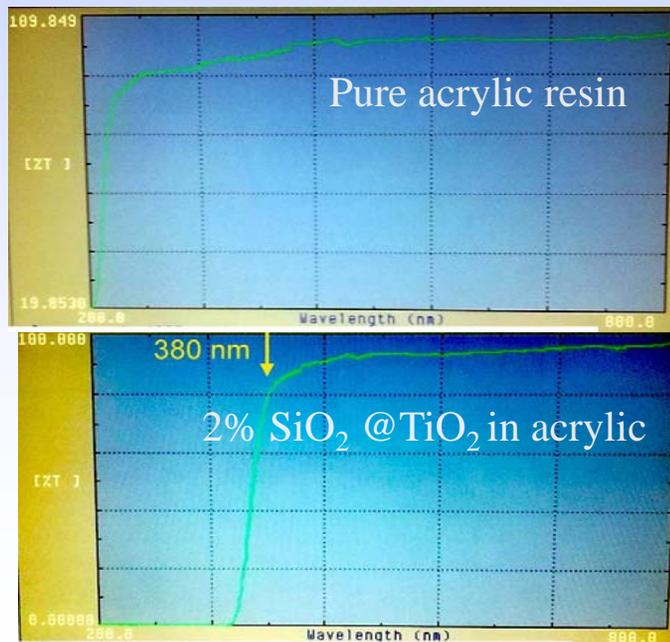
- \$ 999,944.43 from DOE SBIR Phase II program

Progress to Date

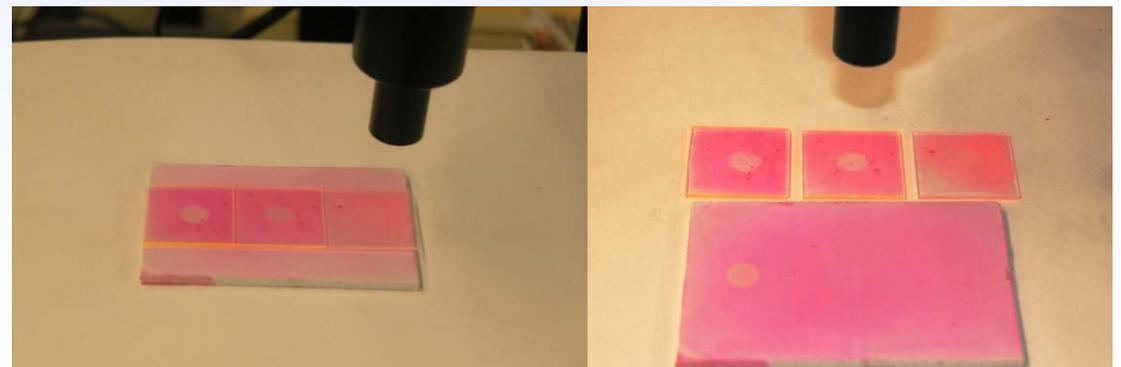
- ❖ Large scale synthesis of $\text{SiO}_2 @\text{TiO}_2$ nanoparticles
- ❖ Optimized the acrylic/ $\text{SiO}_2 @\text{TiO}_2$ coating formulation and spray coating process
- ❖ Demonstrated UV protection capability of $\text{SiO}_2 @\text{TiO}_2$ additive in acrylic resin



High clarity of $\text{SiO}_2 @\text{TiO}_2$ /acrylic coating



UV testing



Expected Outcomes and Next Step



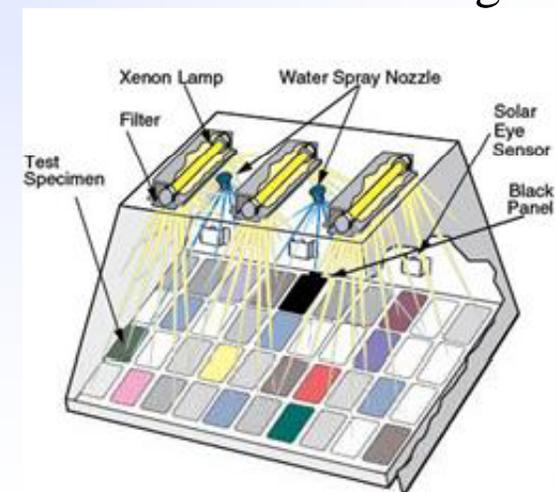
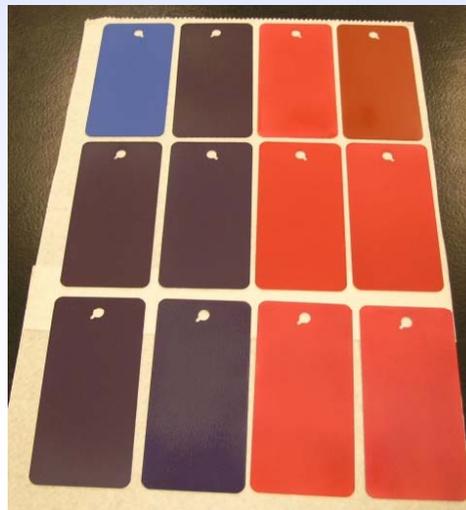
❖ Expected Outcomes

- Developed formulation processes for large scale (10 gallon) synthesis of TiO_2 and $\text{SiO}_2 @ \text{TiO}_2$ nanoparticles
- Developed a commercially-viable UV protective paint formulation
- At the end of Phase II, Demonstrate the preparation of 10 gallon UV protective paint and develop a coating application protocol
- Arkema signed NDA with Nanotrons and evaluated UV protective paint for cool roof application

❖ Next step

- UV protection evaluation and weathering test for color cool roof coatings
- Marketing analysis

Coated color cool roof samples



Ongoing weathering test in Q-Lab