Self-Cleaning, Self-Curing Solar Panel Coating

MOST Microporous Oxides Science and Technology

https://microporousoxides.com

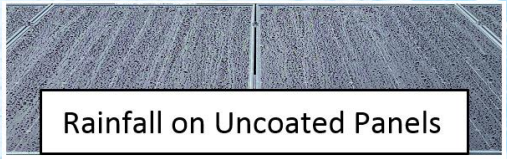
MADISON AREA TECHNICAL COLLEGE

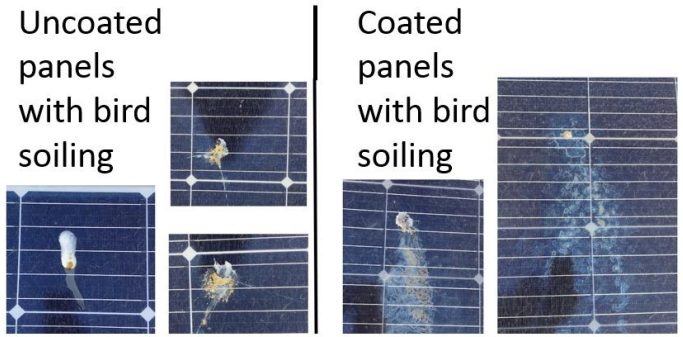
Problem: Soiled panels decrease solar energy production

- **Dirt lowers** solar panel output by 15% or more
- Cleaning panels is costly and requires a lot of water
- **Existing organic coatings** need to be **reapplied every 2 to 5 years** due to **weathering** and **UV exposure**
- Use of **volatile organic solvents** has **negative environmental impacts**

Solution: MOST markets aqueous silica-titania nanoparticle suspensions

- **Easily spray coated** to form transparent thin films (< 1 micron)
- **Cures** and **hardens** when **exposed to UV light** so **no need for heating**
- **Silica in coating** is negatively charged and **repels most dirt particles**
- UV light activates titania which degrades organic contaminants
- **Hydrophilic surface** allows rain to sheet and **wash off dirt**
- Single-application ceramic coating is durable and lasts longer than competing organic coatings
- **Suspension** costs $300/gal but **only needs 35 mL** to coat a **2x1-m panel** so cost is $2.75 per panel or less than 1 cent per Watt
- Over 3% increase (see Percent Gain column in table) in power output demonstrated in pilot-scale field test over **18 months** at Madison College





Goal: Partner with a US-based glass or solar panel manufacturer(s) to integrate MOST's coating technology into their manufacturing process.

Team: Led by scientists formerly from the University of Wisconsin, MOST has over 25 years experience making and using aqueous nanoparticle suspensions. Madison College (MC) is a national leader in solar photovoltaics and serves as our American Made Solar Prize Connector. MC operates the largest rooftop PV system in Wisconsin and works with numerous solar contractors through its renewable energy industry advisory board.

Plan:

Ready! Set up pilot spray coating system at MOST to help optimize the coating system. Characterize coating properties. Install additional field test systems.

Set! Further characterize coating properties (thickness, uniformity, reflectivity, durability) at DOE laboratories. Extend testing to arid and humid climates.

Go! Continue testing to develop statistically significant data demonstrating coating performance in order to partner with a US glass and/or solar panel manufacturer(s) to commercialize MOST's self-cleaning coating.

Module Surface Treatment	Rack	Azimuth	Tilt Angle	Mean Lifetime Energy (kWh)	Standard Deviation	Percent Gain	Mean Annual Yield (kWh/kW)
Uncoated	EcoFoot **fixed tilt** south facing	180°	10°	586.7	18.97	3.52%	1058
Coated				607.3	8.78		1097
Uncoated	PV Booster **vertical axis tracking**	60° to 300°	30°	786.9	29.77	3.05%	1361
Coated				810	3.37		1406

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