



Optical and Durability Evaluation for Silvered Polymeric Mirrors and Reflectors

**Cooperative Research and
Development Final Report**

CRADA Number: CRD-08-316

NREL Technical Contact: Matthew Gray

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Cooperative Research and Development Final Report

In accordance with Requirements set forth in Article XI.A(3) of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

CRADA Number: CRD-08-316

CRADA Title: Optical and Durability Evaluation for Silvered Polymeric Mirrors and Reflectors

Parties to the Agreement: 3M Company

Joint Work Statement Funding Table Showing DOE Commitment:

Estimated Costs	NREL Shared Resources
Year 1	\$ 150,000.00
Year 2	\$ 00.00
Year 3	\$ 00.00
TOTALS	\$ 150,000.00

Abstract of CRADA Work:

3M is currently developing silvered polymeric mirror reflectors as low-cost replacements for glass mirrors in concentrating solar power (CSP) systems. This effort is focused on development of reflectors comprising both metallized polymeric mirror films based on improved versions of ECP-305+ or other durable mirror film concepts and appropriate mechanically robust substrates. The objectives for this project are to reduce the system capital and operating costs and to lower the levelized cost of energy for CSP installations. The development of mirror reflectors involves work on both full reflectors and mirror films with and without coatings. Mirror reflectors must meet rigid optical specifications in terms of radius of curvature, slope errors and specularity. Mirror films must demonstrate long-term durability and maintain high reflectivity. 3M would like to augment internal capabilities to validate product performance with methods and tools developed at NREL to address these areas.

Summary of Research Results:

Primary work for this CRADA was carried out in accelerated weathering and periodic optical characterizations. 3M reflector materials were exposed on the Ultra-Accelerated Weathering System ([UAWS] an R&D 100-winning technology developed in part by NREL) as well as in regular outdoor exposure (no acceleration) and ATLAS Ci-5000 Weatherometers (~8x acceleration. The UAWS has a concentration factor of 100x in the solar ultraviolet (UV) spectral region and, depending on cooperation of the weather, can achieve a 30-year equivalent exposure dose in the UV spectral region in ~1 – 1.5 years. UV exposure and degradation is the most typical failure mode for film reflectors. Over the course of this CRADA we were able to show that the 3M reflector films could endure the 30 year life expected of CSP plants without significant degradation of overall reflectance or specularity. 3M has since made the reflector film that they were testing during this CRADA commercially available.

Subject Inventions Listing:

None

Report Date:

June 24, 2014

Responsible Technical Contact at Alliance/NREL:

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