



Commercialization of High-Temperature Solar Selective Coating

**Cooperative Research and Development
Final Report**

CRADA Number: CRD-08-300

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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.

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CRADA Title: Commercialization of High-Temperature Solar Selective Coating

Parties to the Agreement: Schott Solar

Joint Work Statement Funding Table showing DOE Commitment:

Estimated Costs	NREL Shared Resources
Year 1	\$ 434,947.00
Year 2	\$ 20,000.00
Year 3	\$ 20,053.00
TOTALS	\$ 475,000.00

Abstract of CRADA work:

The goal for Concentrating Solar Power (CSP) technologies is to produce electricity at 15¢/kilowatt-hour (kWh) with six hours of thermal storage in 2015 (intermediate power) and close to 10¢/kWh with 12-17 hours of thermal storage in 2020 (baseload power). Cost reductions of up to 50% to the solar concentrator are targeted through technology advances. The overall solar-to-electric efficiency of parabolic-trough solar power plants can be improved and the cost of solar electricity can be reduced by improving the properties of the selective coating on the receiver and increasing the solar-field operating temperature to >450°C. New, more-efficient selective coatings will be needed that have both high solar absorptance and low thermal emittance at elevated temperatures. Conduction and convection losses from the hot absorber surface are usually negligible for parabolic trough receivers. The objective is to develop new, more-efficient selective coatings with both high solar absorptance ($\alpha > 0.95$) and low thermal emittance ($\epsilon < 0.08 @ 450^\circ\text{C}$) that are thermally stable above 450°C, ideally in air, with improved durability and manufacturability, and reduced cost.

Summary of Research Results:

During the initial phase of the project, a sputter coating process was developed for deposition of a multi-layer selective coating. The best result of the process development was a coating with high solar absorptance (0.94) and good thermal emittance (~0.30 @ 450 °C). This was considered a promising prototype. However, in this preliminary testing and development, we

were unable to match the realized performance to the design prediction. Well-performing material parameters and design specifications were transferred to Schott, which worked with the critical refractory metal alloy layer to explore the manufacturability and benefits of the material. Schott's results indicated that there was some promise in the base material for high-temperature applications (high reflectance in the IR). Work has continued on the development of a selective coating through a DOE Office of Energy Efficiency and Renewable Energy-funded project for High-Temperature (700 °C) Tower Receiver applications.

Subject Inventions Listing:

None

Report Date:

12/10/2013

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