



## CdTe PV Modules and Fire

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### Summary:

#### “Emissions and Encapsulation of Cadmium in CdTe PV Modules During Fires”

By V. M. Fthenakis, M. Fuhrmann, J. Heiser, A. Lanzirotti, J. Fitts, and W. Wang. *Prog. Photovolt: Res. Appl.*, 2005, 13 (8), 713-723.

In this study, fire testing was conducted on commercial CdTe modules according to standard Underwriters Laboratories (UL) and American Society for Testing and Materials (ASTM) test protocols. The experiments heated pieces of the modules to temperatures of 760-1100°C to simulate exposure to residential and commercial building fires. Four different types of analysis were performed to investigate emissions and redistribution of Cd and Te of the heated modules. These experiments showed that almost all of the cadmium content of CdTe PV modules is encapsulated in the molten glass – 99.96% of the cadmium is retained in the glass matrix. Emissions of cadmium during fires in central PV systems are considered to be essentially zero.

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In addition, independent review has concluded that “First Solar’s CdTe modules do not represent an environmental risk under normal operating conditions. The potential environmental impacts in the case of fire and landfill deposition are extremely low according to standard test protocols and standards.”\* CdTe has an extremely low vapor pressure, has high boiling and melting points, and is almost completely encapsulated by molten glass when exposed to fire. Exposure of pieces of CdTe PV modules to flame temperatures of 760-1100°C illustrated that CdTe diffuses into the glass, rather than being released into the atmosphere. Higher temperatures produce further CdTe diffusion into the molten glass

\*Peer Review of Major Published Studies on the Environmental Profile of Cadmium Telluride (CdTe) Photovoltaic (PV) Systems, Summary Report, European Commission, DG JRC, Institute for Environment and Sustainability, Renewable Energies Unit. Available from: <http://re.jrc.ec.europa.eu/refsys/pdf/Report%20Summary-peer%20review.pdf>

