

Comparing the Environmental Impacts of Nanoscale and Bulk Materials in Photovoltaics

Supporting/Contributing Agency: U.S. EPA

In 2008, Professor Vasilis Fthenakis, Dr. Huyng-Chul Kim, and students Sandra Gualtero and Rob van der Meulen, reported a methodology for comparing the environmental impacts of nanomaterials and bulk materials used in the production of photovoltaics (PVs). They focused on third-generation nanocrystalline silicon/amorphous silicon and nanocrystalline CdTe/CdSe solar cells and second-generation commercial thin-film technologies. Professor Fthenakis' group developed a life cycle analysis (LCA) framework (Figure) for measuring environmental indicators based on investigations of the following parameters that differentiate nanotechnology from conventional technology through the life cycle of PV:

- Methods and efficiencies of synthesizing feedstock materials
- Physical specifications of the precursors; material utilization rates and process efficiencies in manufacturing
- Deposition processes and parameters
- Energy-conversion efficiency of solar cells
- Life-time expectancy of the final product

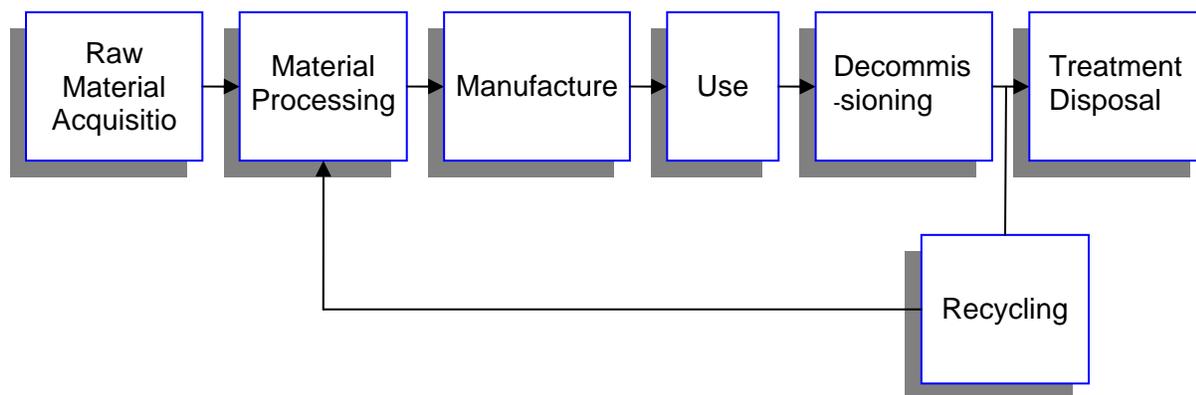


Figure. *Caption.*

This methodology is expected to provide a necessary input in decision-making related to supporting R&D and deployment of new solar conversion technologies.

Reference/Publication

Fthenakis V., S. Gualtero, R. van der Meulen and H.C. Kim, Environmental Implications of Nanostructured Photovoltaics: A Comparative Life-cycle Analysis Framework, Material Research Society Symposium Proceedings, Vol. 1041, pp. 25-32, 2008.