Nanoengineering low-cost silicon solar cells

Title
Pro and cons of iron precipitates in crystalline silicon solar cells
Rautaerkaumien haitat ja hyödyt kiteisissä piiaurinkokennoissa

Content
Silicon solar cells are a promising way to produce significant amounts of low-carbon electricity. Despite recent advancements within the silicon solar cell industry, further increases in the cost-efficiency of silicon solar cells are necessary if internationally agreed-upon climate targets are to be met.

Silicon solar cell’s mission is to turn light into electricity with as high efficiency as possible. Trace metal impurities in silicon can significantly hamper this mission even at parts-per-billion concentrations. This Thesis combines multi-scale characterization techniques and predictive numeric simulations to map the impact of these metal impurities from the nanoscale to macroscale.

The Thesis presents new insights into the physical behavior of metal impurities in silicon solar cells and enables the manufacturing of high-efficiency silicon solar cells from cheaper silicon feedstock. As a result, the cost-efficiency of solar electricity is enhanced, increasing its cost competitiveness to fossil fuel alternatives and enabling faster climate change mitigation with solar photovoltaics.

Field of research
Micro and nanotechnology

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