Faster Simulations Help Revolutionize Thin Film Solar Cells

NEXT ENERGY
EWE-Forschungszentrum für Energietechnologie e.V.

NEXT ENERGY develops solutions for the energy supply of the future by conducting extensive research – in conjunction with key industry players – that focuses on three technological areas: Photovoltaics, Fuel Cells and Energy Storage Facilities.

The Challenge

NEXT ENERGY is changing the face of solar power by developing innovative and sophisticated solar cells that are 100x thinner than traditional panels. Through a unique blend of silicon in amorphous and microcrystalline form, which is deposited as a multispectral solar cell, NEXT ENERGY is building solar cells that are exceedingly space and cost effective. An absorbing layer with hundreds of nanometer light trapping features is implemented in the cell structure to increase the absorption of light and optimize conversion efficiency.

NEXT ENERGY is faced with the challenge of identifying the ideal surface structure for thin-film solar cells – which remains largely unknown. NEXT ENERGY is using Synopsys® Sentaurus TCAD to run performance simulations that aid in the development and refinement of solar cells. The NEXT ENERGY simulation domain consists of several thin layers with rough interfaces. Simulation times are a massive roadblock to advancing the solar cell because the large domain and fine mesh resolution require days to run, resulting in prototyping delays.

The Solution

NEXT ENERGY has turned to Acceleware's FDTD solver to increase their simulation efficiency and prevent a backlog in the solar cell development phase. Acceleware software integrates with Sentaurus TCAD and an NVIDIA® GPU to dramatically shorten simulation times.

The Solution

Previously, the simulation time for a complete wave spectrum from 350nm to 850nm required more than 21 hours to complete. Now, after implementing Acceleware's FDTD solver, the simulation time for the spectrum has decreased to 1.5 hours. This demonstrates a 15x simulation speed up factor for the complete wave spectrum. In addition to delivering simulation results in a fraction of the time, NEXT ENERGY also achieved an optimized workflow and outstanding results without the need for an expensive hardware cluster.

> "Acceleware helped us to better understand the light trapping effects and to predict the optimal light trapping structures for amorphous and micromorph silicon thin- film solar cells. We recognize the benefit of using Acceleware software and the implications it holds for our future projects."
>
> Jürgen Lacombe
> NEXT ENERGY

The Impact

As a result of Acceleware's technology, NEXT ENERGY improved the design, efficiency and performance of the thin-film solar cell. The simulation of a complete tandem structure was achieved – the equivalent to a massive increase in the z-dimension. An expansion of the spectrum to higher wavelengths also became more realistic. The accelerated speed and precision of simulations helped expand the xy dimensions of the solar cell images by 10x, creating an exceptional match between the simulations and working models.

NEXT ENERGY is capitalizing on the rapidly growing opportunities for thin-film solar cells in the commercial marketplace. Thin-film technology requires considerably less material than traditional solar cells and thus contains enormous cost-saving potential. NEXT ENERGY counts on Acceleware's FDTD solver to further develop their research and harness their full potential in the field of photovoltaics.

© 2012 Acceleware Ltd. All rights reserved. All third-party product and company names may be trademarks of their respective owners.
Specifications subject to change without notice. Products may not be exactly as shown. Printed in Canada 2011.