**CZTS nanoparticle absorber layer for thin film solar cells**

**Joanna Symonowicz1, Kirsten M. Ørnsbjerg Jensen2, Sara L. J. Engberg3, Stela Canulescu3**

**1 Niels Bohr Institute, University of Copenhagen; 2 Department of Chemistry, University of Copenhagen; 3 Department of Photonics Engineering, Technical University of Denmark**

Cu2ZnSnS4 (CZTS) thin film solar cells have the potential to revolutionize the solar energy market. They are cheap, non-toxic and present an efficiency up to 9,2% [1]. However, to commercialize CZTS nanoparticle thin films, the efficiency issues must yet be resolved.

There are various fabrication processes for obtaining the CZTS absorber layer. Here, we apply the hot-injection method, in which a cheap, ligand-free nanoparticle ink is produced that can easily be applied to a substrate to form a uniform thin film. While this method can produce CZTS nanoparticles [2], the main challenge is to obtain a pure CZTS kesterite phase without secondary phases as they result in structural inhomogeneity, local fluctuation of open circuit voltage and high carrier recombination [3]. This leads to poor device performance and repeatability issues.

Here, we present how the synthesis parameters affect the resulting CZTS nanoparticles. The product is characterized by XRD, EDS, and Raman spectroscopy in order to fully detect possible secondary phases and characterize the CZTS phase. By combining Rietveld refinement of the XRD data with X-ray total scattering with PDF analysis, the nanoscale atomic structure is furthermore characterized. Photoluminescence measurements indicate which absorber layer are of higher efficiency, which allows us to study why some crystalline configurations enhance the efficiency of resulting solar cells.

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[2] N. Mirbagheri at al., Nanotechnology 27 (2016), 185603 (8pp)

[3] M. Kumar at el., Energy Environ. Sci. (2015), 8, 3134