

Accepted Manuscript

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PII: S0040-6090(14)01048-7
DOI: doi: [10.1016/j.tsf.2014.10.077](https://doi.org/10.1016/j.tsf.2014.10.077)
Reference: TSF 33841

To appear in: *Thin Solid Films*



Please cite this article as: Marco Brandl, Rameez Ahmad, Monica Distaso, Hamed Azimi, Yi Hou, Wolfgang Peukert, Christoph J. Brabec, Rainer Hock, In-Situ X-ray Diffraction Analysis of the Recrystallization Process in $\text{Cu}_2\text{ZnSnS}_4$ Nano Particles Synthesized by Hot-Injection, *Thin Solid Films* (2014), doi: [10.1016/j.tsf.2014.10.077](https://doi.org/10.1016/j.tsf.2014.10.077)

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In-Situ X-ray Diffraction Analysis of the Recrystallization Process in Cu₂ZnSnS₄ Nano Particles Synthesized by Hot-Injection

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Abstract

Kesterite Cu₂ZnSnS₄ (CZTS) is a promising material for thin film solar cell applications. The biggest advantages of this compound lie in the abundance and non-toxicity of the contained elements. Low temperature hot injection synthesis can provide an economic way to produce CZTS nano particles for application in solution processed solar cells. Powder X-ray diffraction (PXRD) measurements on the as-synthesised particles suggest that the crystal structure is cubic and can be best described as sphalerite-like. This means that the cations in the CZTS are statistically distributed on the cation sites of the crystal lattice rather than well-ordered like in the tetragonal kesterite structure. An in-situ PXRD measurement while annealing the particles up to 550° C revealed a recrystallization process that transforms the structure from cubic to tetragonal meaning an ordering of the cations.

1. Introduction

In recent research for thin film photovoltaics, the chalcogenide material Cu₂ZnSnS₄ (CZTS) has attracted interest as a potential future absorber material in photovoltaics.

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