

Fall 10-5-2015

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## Recommended Citation

Arthur Lantreibeccq, Etienne Pihan, Jean Francois Monchoux, and Marc Legros, "In situ high temperature TEM tensile testing of pseudo single crystalline Si for PhotoVoltaic applications" in "Nanomechanical Testing in Materials Research and Development V", Dr. Marc Legros, CEMES-CNRS, France Eds, ECI Symposium Series, (2015). [http://dc.engconfintl.org/nanomechtest\\_v/121](http://dc.engconfintl.org/nanomechtest_v/121)

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# IN SITU HIGH TEMPERATURE TEM TENSILE TESTING OF PSEUDO SINGLE CRYSTALLINE SI FOR PHOTOVOLTAIC APPLICATIONS

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**Key Words:** In situ TEM testing, dislocations, Sub grain boundaries, Solar Si

Single crystalline Silicon has the highest efficiency to convert sunlight into electricity. Its production is however costly. On the other hand, cheap polycrystalline Si cells can be produced, with a 10% lower PV conversion efficiency. A promising technique, dubbed "mono-like" Si consists in growing pseudo-single crystalline Si ingots from a tile of single crystalline seeds aligned at the bottom of the crucible. At the present time, this technique is confronted to the high density of defects that multiply during solidification, fueled by the thermal gradients generated in the furnace. Some of these defects have small impact on the electrical properties but others are heavy recombination sites and should be avoided. Here, we focus on dislocations, micro twins and grain boundaries. Their mutual interaction may act as stress concentrators or sinks. We are working at various scales (Fig. 1a-b) to understand these interactions that occur both at long ranges and atomic-scale processes. To gain insight about the later, we have started to tensile strain dedicated micro-samples in situ in the TEM at temperatures between 900 and 1000°C (the melting temperature of Si is 1414°C). We have shown that multiplication processes are initiated at existing GBs and that mobile dislocations are poorly affected by Peierls stresses at this temperature. Interactions of dislocations with twins (Fig 1c) are currently investigated, along with twin terminations and initiation sites.

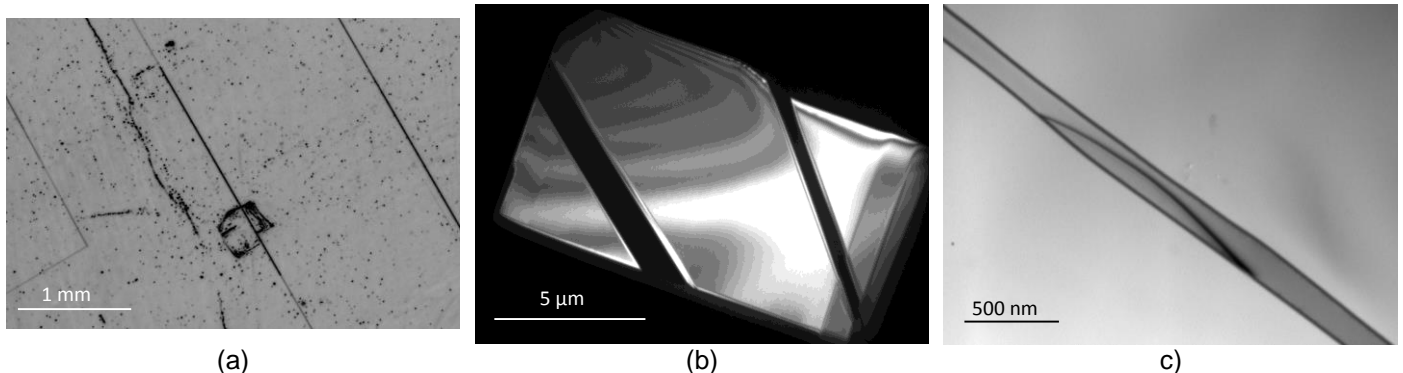


Figure 1. Micro twins observed in PV "mono-like" Si (a) optical microscope, (b) Dark field TEM, (c) dislocation-twin interaction (TEM)

This project has received support from the French National Program "Investment for the Future" bearing the reference (ANR-10-ITE-0003)