Liquid Si 2.0
Liquid phase deposition of Functional Silicon Layers for Cost-Effective High Efficiency Solar Cells

Project Duration: 10.2017 – 09.2020
Initial report submitted: 11.2017

Summary

Primary target of this project is the manufacture of low-cost highly efficient PV cells employing p-/n-doped thin silicon layers prepared by liquid phase processing of hydrogenated polysilanes. Key-important to all high efficiency solar cell concepts is the targeted deposition of highly doped layers or structures of multi-crystalline silicon (mc-Si). Typically, these layers are generated by vacuum based deposition techniques e.g. CVD (chemical vapour deposition). In many cases necessary subsequent patterning steps result in laborious, multi-step procedures with a high demand of consumable materials and cell manufacturing lines featuring a multitude of costly tools. Solution-based silicon deposition and processing starting from hydrogenated polysilanes is an appealing and cost efficient alternative. Precursors currently used in this context such as Si_5H_{10} (CPS), Si_6H_{12} (CHS) or Si_5H_{12} (NPS), however, suffer from the lack of proper synthetic approaches suitable for their preparation on a larger scale, their unsuitable volatility and their undesirable pyrophoric character. The aim of this project is the development of commercially viable synthetic pathways suitable for the large-scale production of alternative perhydridopolysilane precursor materials (Liquid Silicon 2.0) for liquid phase silicon deposition. Furthermore, mc-Si layers will be deposited from the resulting target materials, characterized with respect to their potential for PV applications and finally tested in prototype low-cost and high-efficiency solar cells. Successful realization of the project will make highly innovative liquid phase processed solar cells with high efficiency available on a broad scale to competitive costs which substantially contributes to the objectives of the Solar Europe Industry Initiative (SEII).

Project consortium

Coordinator and contact details:

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Participating countries and financing:

Country	**Number of organisations involved**	**Project costs in EUR**	**Public funding in EUR**
Germany	1	504’489	327’918
Austria	1	373’633	317’588
Total	*2*	*878’122*	*645’506*

Funding agencies involved and contracts

Funding Agency	**Contract N° and Title**
Projektträger Energie – Technologie – Nachhaltigkeit Forschungszentrum Jülich GmbH in der Helmholtz-Gemeinschaft	Förderkennzeichen: W049 „Liquid Si 2.0 – Liquid Phase Deposition of Functional Silicon Layers for Cost-Effective High Efficiency Solar Cells”
Klima und Energiefonds Österreich	Projektnr. 858491 Liquid phase deposition of Functional Silicon Layers for Cost-Effective High Efficiency Solar Cells