

Understanding the Effect of Grown-In Defects in Silicon on Solar Cell Efficiency

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Improving the efficiency of silicon-based solar cells is imperative to maximise the harnessed solar power. The current improvements in efficiency were attained by better manufacturing techniques and purer materials. There is however indirect evidence that the so-called agglomerated grown-in defects in silicon have a direct impact on cell efficiency and if this is the case, the efficiency could be improved by crystal engineering. This research focuses on understanding the defect generation and growth mechanisms in commercial silicon crystals and their impact on cell efficiency. Different silicon crystals were grown and silicon wafers from different parts of these crystals, having a range of oxygen, dopant concentrations, and growth profiles, were then investigated. These wafers were characterised using various tools and techniques such as Infrared Light Scattering Tomography (LST) to measure the defect density, and Fourier Transform Infrared (FTIR) spectroscopy to measure the oxygen concentration. Solar cells were then fabricated out of these wafers to measure the performance of the devices. An understanding of why and how such defects impact the yield of different silicon wafers will lead to a thorough understanding of the relationship between the defect types/size/densities and cell efficiency, and also shed light on the development of crystal recipes or after-crystal procedures to eliminate or minimise these effects on the solar cell performance. This project is funded by the Energy and Water Agency under the National Strategy for Research and Innovation in Energy and Water (2021–2030), and is being carried out in collaboration with the Center for Solar Energy Research and Applications (ODTÜ-GÜNAM) and the industrial partner Kalyon PV.

Subjective Wellbeing in Malta – An Interactive Online Data Dashboard

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Malta has undergone rapid development since gaining independence and now performs exceptionally well on traditional metrics of material wellbeing like Gross Domestic Product (GDP). It is more laggard on broader indicators of sustainable development or quality-of-life (for instance, work-life balance) but still positions well in world rankings. Yet neither the narrow view of material-wellbeing, nor the broader view offered by objective data dashboards, have, to date, been capable of offering a complete picture of wellbeing in Malta – in that they lack the dimension of subjective wellbeing. Surveys asking how people feel can offer a democratic and direct account of wellbeing – as judged by individuals themselves. Furthermore, generating sufficiently large representative data-sets on self-assessed wellbeing offers the potential to go beyond national averages to allow the examination of disaggregated data pertaining to diverse socio-economic groups. This presentation showcases the results of a collaboration of the Malta Foundation for the Wellbeing of Society, with the University of Malta, resulting in a dedicated on-line portal acting as a one-stop-shop of Wellbeing Indicators, Networking, Data, Exploratory studies and eXchange (INDEX). Within this, a dashboard of subjective wellbeing data in Malta visualises indicators on satisfaction (in different life domains) and affect (positive and negative emotions), collected by the National Statistics Office utilising the European Union's "Wellbeing Module" (SILC). Users may juxtapose wellbeing trends against a range of relevant variables on income and living conditions as well as drilling down by demographic characteristics in order to obtain insights on wellbeing in Malta.

