

# Research to probe deep within a solar cell

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Engineers and scientists from the University of Sheffield have pioneered a new technique to analyse PCBM, a material used in polymer photovoltaic cells, obtaining details of the structure of the material which will be vital to improving the cell's efficiency. The findings are published in *Applied Physics Letters*.

Working with the ISIS pulsed neutron and muon source at the Science and Technology Facilities Council Rutherford Appleton Laboratory, the researchers are the first to use a cutting-edge neutron scattering technique called SERGIS to analyse PCBM. The technique – still very much in development – has so far only been tested on samples with well-known, regular structures, such as diffraction gratings.

The experiment focused on crystallites of PCBM which were on the surface of a thin film of the [solar cell material](#) as the researchers could then verify their findings using other analysis techniques, such as [atomic force microscopy](#). But they believe the technique could in future be used to analyse the material's structure deep inside the active layers of a solar cell. This will enable them to understand how different [fabrication methods](#) impact on the cell's structure, and therefore its efficiency.

Dr Alan Dunbar from Sheffield's Faculty of Engineering explains: "The SERGIS technique uses polarised neutrons which are bounced off the sample being tested. Where the resulting neutrons end up and how their [polarisation](#) has changed tells us information about the structure within our samples. The advantage of this type of technique is that because neutrons only interact weakly with the sample we can probe much

deeper where many microscopy techniques cannot see."

"This is the first time the technique has been used to look at this material which is of real interest to science. It enabled us to map the size of the PCBM crystallites and the distance between them, both properties which are key to improving efficiency."

Research into [photovoltaics](#) is one of many areas of energy research conducted at the University of Sheffield, including wind power, nuclear power, biofuels, district heating and carbon capture.

SERGIS – which stands for neutron spin echo resolved grazing incidence scattering – can only be conducted in a few places worldwide, among them the ISIS pulsed neutron and muon source in Oxfordshire.

Provided by University of Sheffield

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