Physicists develop approach to increase performance of solar energy

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Experimental condensed matter physicists in the Department of Physics at the University of Oklahoma have developed an approach to circumvent a major loss process that currently limits the efficiency of

commercial solar cells.

Solar cells convert the sun's energy into electricity and are the main component of solar panels and many types of electrical devices as broad-ranging as satellites and calculators.

Members of the Photovoltaic Materials and Devices Group, led by OU associate professor in the Homer L. Dodge Department of Physics and Astronomy, Ian Sellers, along with theorists at Arizona State University, led by David K. Ferry, have demonstrated a breakthrough toward the development of a hot carrier solar cell.

A hot carrier solar cell is a device that would increase the efficiency of solar cells by more than 20%, which Sellers said would be a significant breakthrough for solar energy.

"Although this device has been the source of a considerable amount of research over the last 10 to 15 years, the realization of a practical solution has thus far eluded researchers with proof-of-principle demonstrations only presented under unrealistic conditions or in materials and structures not relevant for solar cell operation," said Sellers.

Sellers says this new approach, recently published in the journal *Nature Energy*, demonstrates "significant progress in the realization of the hot carrier solar cell and the potential for ultra-high-efficiency single-junction semiconductor devices, which would revolutionize the field of photovoltaics and renewable energy generation."

More information: Esmaielpour, H., Dorman, K.R., Ferry, D.K. et al. Exploiting intervalley scattering to harness hot carriers in III–V solar cells. *Nat Energy* 5, 336–343 (2020). doi.org/10.1038/s41560-020-0602-0 ,

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