# KANSAS EPSCoR

A NSF EPSCoR-funded Success Story | Spring 2016

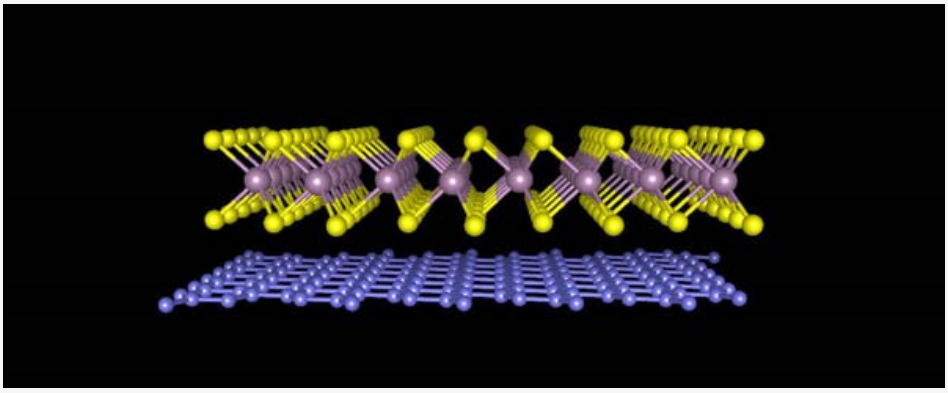
NATIONAL SCIENCE FOUNDATION

EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH

EPSCoR

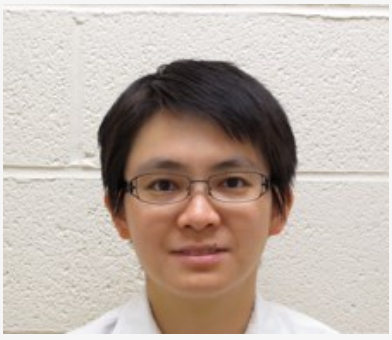
## Research yields material made of single-atom layers that snap together like Legos

Exciting scientific breakthroughs are milestones that Kansas NSF EPSCoR strives for in its mission to tackle global challenges like climate change and solar-based renewable energy. EPSCoR supported physicists at the University of Kansas have achieved such a milestone by creating a new substance from two different atomic sheets that interlock much like Lego toy bricks. According to the researchers, the objective of this investigation was to design new synergistic materials by combining two single-atom thick sheets. Prior to this discovery, building artificial materials with synergistic functionality was challenging because most materials had different atomic arrangements at the interface and could not connect.



**Above, a computer image of research efforts at the University of Kansas to connect atom sheets of tungsten disulfide and graphene thereby forming an entirely new material that has shown much promise.**

Hsin-Ying Chiu, assistant professor of physics and astronomy at KU benefited from receiving a KNE First Award in 2013, spurring her research program that contributed to this discovery. Chiu and her team, experimented with an innovative and versatile "layer-by-layer," bottom-up nanofabrication technique to connect an atomic sheet of graphene to an atomic sheet of tungsten disulfide to form a new synergistic material designed to improve solar cell proficiency. The new material utilized the best components of the individual atomic sheets and showed promise in the development of more efficient solar cells and flexible electronics.



**Hsin-Ying Chiu, Assistant Professor of Physics & Astronomy at the University of Kansas**

Chiu worked with Hui Zhao, associate professor of physics and astronomy at KU using ultrafast laser spectroscopy in KU's Ultrafast Laser Lab to analyze the movement of electrons between the two materials. Their research along with the use of the facility also contributes directly to another NSF EPSCoR funded project called Imaging and Controlling Ultrafast Dynamics of Atoms, Molecules, and Nanostructures. It is a collaboration between Nebraska and Kansas studying how light interacts with matter that involves 30 researchers including Zhao.

The research groups led by Chiu and Zhao are further testing this Lego approach to fabricate more synergistic materials. By combining atomic sheets that absorb light of different colors, they can potentially produce a large number of new synergistic substances that react to the solar spectrum and convert energy between electricity and radiation.