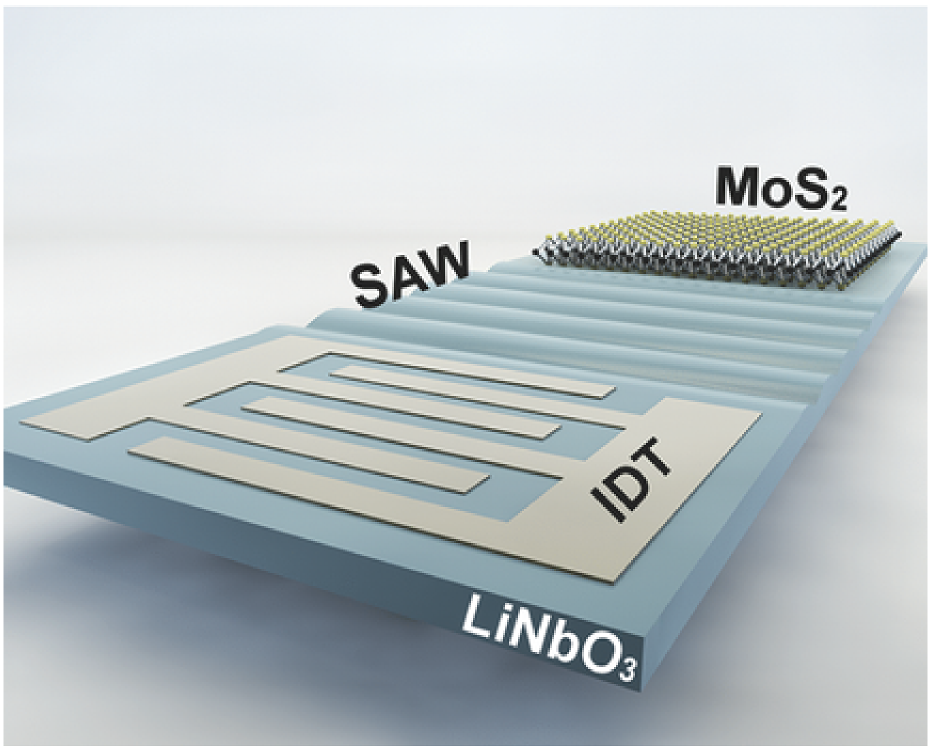
'Nano-earthquakes' hold key to smarter electronics

March 12 2015, by David Glanz



The performance of mobile phone cameras and solar cells could be boosted by "nano-earthquakes", researchers have found.

RMIT University's Dr Sumeet Walia and Dr Amgad Rezk have examined the use of sound waves to controllably change the electronic properties of 2D materials, in a study led by Dr Sharath Sriram.

Their work will be published tomorrow (Thursday, 12 March) in the journal *Advanced Optical Materials*.

The finding has important implications for electronics and optoelectronic devices made from 2D materials, opening the door to a new era of highly efficient solar cells and smart windows.

Other possible fields of applications could include consumer imaging sensors suitable for low-light photography, for example in mobile phone cameras, which currently suffer from poor low-light performance, or in sensors for fluorescence imaging.

The RMIT research looked at ways of using surface acoustic waves or "nano-earthquakes" to control the properties of 2D materials.

"Sound waves can be likened to ripples created on the surface of water, but where we can control the direction and intensity of these ripples," Dr Walia said.

"In this work, we use these ripples which occur on a crystal surface and couple it into a material that is a few atomic layers thick (2D material), which causes a change in its electronic properties.

"As the surface acoustic waves are turned on and off or increased and decreased in intensity, the change in electronic properties of the 2D materials follows the same pattern."

Dr Rezk said: "We've found that 'nano-earthquake'-like waves under the surface of the 2D materials drag electrons along their path, thereby tuning the amount of light emitted by the material. Remarkably, the acoustic wave based tunability did not result in any structural or compositional change in the material.

"As soon as the acoustic waves were removed, the material retracted back to its initial optical state, and therefore this mechanism is highly adaptable for a variety of dynamically operating systems."

More information: "Acoustic–Excitonic Coupling for Dynamic Photoluminescence Manipulation of Quasi-2D MoS2 Nanoflakes." *Advanced Optical Materials*. doi: 10.1002/adom.201500034 . onlinelibrary.wiley.com/doi/10 … m.201500034/abstract

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