New combinations of oxides and semiconductors can create new electronic devices

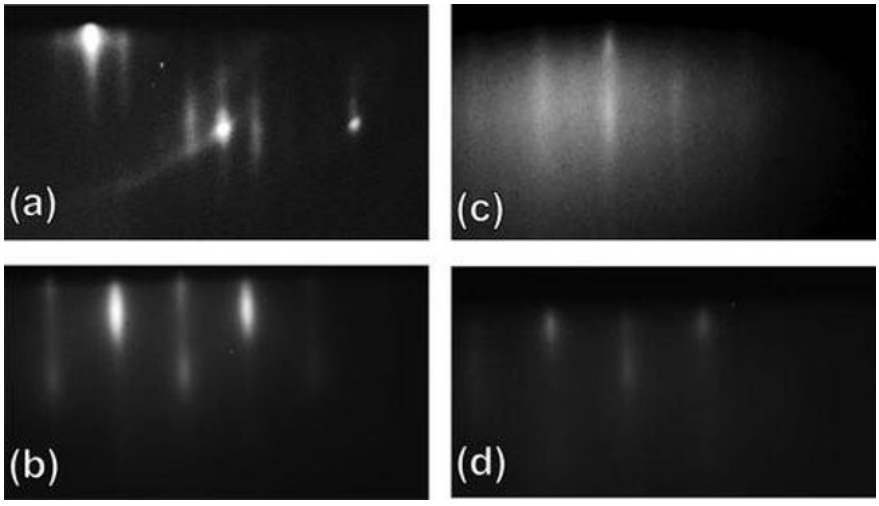
Yale University researchers have developed a 2DEG system on gallium arsenide, a semiconductor that is effective at absorbing and emitting light.

Insulating oxides are oxygen-containing compounds that do not conduct electricity, but can sometimes generate conductive interfaces when they are correctly stacked together. Conductive electrons at the interface form a two-dimensional (2DEG) electron gas with strange quantum properties that make the system useful in light and electronic applications.

Yale University researchers have developed a 2DEG system of gallium arsenide, a semiconductor that is effective in absorbing and emitting light.

This development promises new electronic devices that interact with light, such as new types of transistors, superconducting switches and gas sensors.

Lior Kornblum, currently working at the Technion Institute of Israel, described the new study appearing in the Journal of Applied Physics, saying: *"I consider this a premise study for oxide electronic devices."* .



The researchers were surprised to see that in a 2DEG system that incorporates two layers of insulating oxide, it could create conductive electrons that act like a gas or liquid between layers of oxide and can transmit information.

Researchers have previously observed 2DEG with semiconductors but the 2DEG oxide has a much higher electron density, making them more potential for some electronic applications.

Oxide 2DEG has attractive quantum properties. For example, this system seems to show an easy combination with high magnetic materials and superconductivity.

In general, it is difficult to produce large quantities of 2DEG oxide because only the necessary pieces of oxide crystals can be made. However, if researchers can develop oxides on commercial semiconductor plates, they can expand the oxide 2DEG used in real-world applications.

Development of 2DEG oxide on semiconductors also allows researchers to better integrate material structures with conventional electronic devices. According to Kornblum, the interaction of electron circuits with electrons in semiconductors can create many new functions and are widely applied in a variety of devices.

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