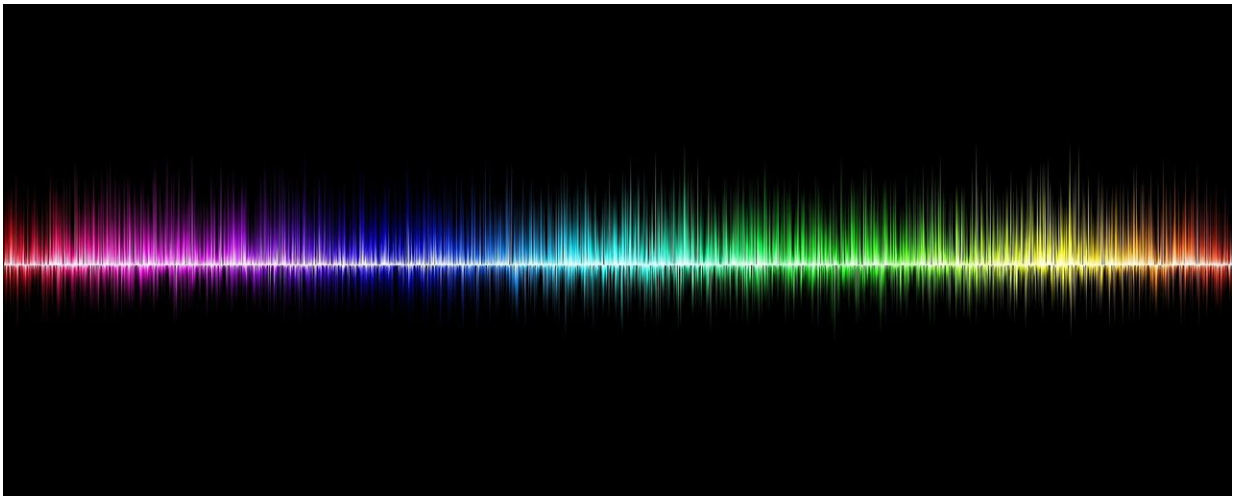
# Researchers discover multilayer band gap using its own technology

January 8 2019



Credit: CC0 Public Domain

Korean researchers at DGIST have proven the existence of the upper band gap of atomic rhenium disulfide ($ReS_2$) layers in the conductive atomic structure of ionization energy. The work resulted from a joint study with Professor Jong-hyun Ahn's research team at Yonsei University.

Academia has only theoretically predicted the ionization energy area of 2-D atomic structures and had difficulties in proving the actual existence of structure. However, Professor Hyunmin Kim's research team at

DGIST could observe the actual structure using a time-resolved second harmonic generation (TSHG) imaging system it developed, proving the existence of disulfide band gap layers.

The system can generate images of the sounds of an atomic-layered structure in high resolution. It increased the measurement sensitivity of the dispersion effects of layer noise and observed electron movements inside transition bands, which consist of visible rays and near-ultraviolet rays, using the probing energy of the infrared bandwidth.

Dr. Kim said, "Through this research, we will be able to clarify the structure of multilayer band gaps existing in various atopic structures besides the rhenium disulfide that was observed this time. It provided important elements to analyze the unidentified causes of electronic activities which contribute to driving the optical sensors and photocatalysts of various 2-D structures. In the future, I hope to develop a device that operates both optically and electrically by a new band gap."

Professor Lee, who calculated the theories that led to this research, said, "We could observe multi-layer bandgaps in this research, which will greatly help with related studies such as observing band gaps of junction structures and improving device agglomeration in the future."

This study was published in *Light: Science and Application* on November 28, 2018.

**More information:** Krishna P. Dhakal et al, Probing the upper band gap of atomic rhenium disulfide layers, *Light: Science & Applications* (2018). DOI: 10.1038/s41377-018-0100-3

Provided by DGIST (Daegu Gyeongbuk Institute of Science and

Technology)