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IISc explores use of nanosheets for better drug delivery

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Previous efforts have focused on using gold nanoparticles for biomedical applications, according to the researchers, but these nanoparticles are expensive and have limited efficiency

In a recent study, researchers from the Department of Organic Chemistry (OC) and Materials Research Centre (MRC), at Bengaluru-based Indian Institute of Science (IISc), show that surface modifications of two-dimensional molybdenum disulphide (2D-MoS_2) nanosheets can make them highly effective for applications like delivering drugs to diseased cells.

Nanomaterials usually need to be modified or customised depending on the application to improve their efficiency. Typically, they are chemically modified through a process called functionalisation, which involves attaching ligands (small or large molecules) to the surface of the nanomaterial.

In the new study, the researchers modified the surface of 2D-MoS_2 nanosheets with thiol (sulphur-containing) ligands. They found that these thiols can be exchanged with naturally-occurring thiols in biological systems, which could allow drugs attached to these nanosheets to be released. These chemically-modified nanosheets were also found to be safe to use inside living cells.

Moving forward, the team plans to work on improving the stability of the nanomaterial in the presence of various thiol-containing liquids and exploring alternative surface modification approaches to customise the nanosheets for other applications. “This work on 2D-MoS_2 nanosheets can be developed in the future as an alternative to RNA and DNA delivery applications, which can be useful for detecting and treating infections such as COVID-19,” said the researchers.