New smart polymeric coating can increase performance of photovoltaic devices

Researchers from the Institute of Nano Science & Technology (INST), Mohali, an autonomous institute under Department of Science and Technology (DST), have designed a synthetic polymer that can mend its own cracks when exposed to ultraviolet light.

The polymer can be used as a smart coating for photovoltaic devices to prevent damages, thereby increasing the performances of such devices. The research supported by DST-SERB has been published in the journal Soft Matter.

The low temperature mending synthetic polymer designed by the research team led by Dr. Asish Pal from INST undergoes photo-crosslinking (photo-induced formation of a covalent bond between two macromolecules), upon UV_B light exposure. This results in making the otherwise flexible polymeric network rigid enough to tune the glass transition temperature. Any crack formation on the polymer-coated surface then can be repaired by UVc light irradiation that renders consequent photo-decrosslinking (photo-induced destruction of a covalent bond) mediated low glass transition temperature T_g polymers.

The approach employs interesting photo-responsive healing that mends damages in specific local sports at ambient conditions, unlike many other self-healing systems that require a higher temperature and are rather challenging to operate within a specific local area.

Nature has an uncanny ability to produce intelligent self-repairing biomaterials that get actively engaged in natural processes like blood clotting, tissue regeneration, *and* so on. Hence, the design of smart and adaptable stimuli-responsive systems in nanoscience owes its fascination in making self-healing materials that autonomically mend in situ at the microscopic level as a response to macroscopic damages. Such materials are potentially envisaged as sustainable and long-lasting materials for applications in electronics, energy, transportation, and coatings.

The approach of the photo-modulated self-healing system demonstrates both inherent and stimuli-responsive self-healing pathways and finds its application in designing smart coating of photovoltaic devices to prevent damages thereby, increasing the performances of the devices for a longer time.