Chemical behavior of skin pigment can give a clue to design of materials for semiconductors & supercapacitors

Melanin, the famous skin pigment, has resisted efforts to reveal its structure, thus remaining an enigma for long. Scientists have now deciphered the reasons behind the chemical behavior of the skin pigment by computing its structure, and this can pave the way for semiconductors and supercapacitors' materials with desired properties based on it.

They have found that the pigment does not have a definite structure and interchanges between structures resulting in heterogeneity. They have also suggested that this same heterogeneity is probably responsible for the extreme photo-absorption properties of brownish or black class of melanin titled eumelanin.

Over the past decade, research on eumelanin, which protects human beings from harmful solar radiation, has been gaining ground because of its unusual properties, such as extreme photo-absorption, efficient non-radiative decay, and quenching of reactive oxygen species.

In a recent review published in WIREs Computational Molecular Science, Dr. Debashree Ghosh of the Indian Association for the Cultivation of Science, an autonomous institution of the Department of Science and Technology (DST), discusses how computational approaches have been instrumental in revealing how heterogeneity that is probably responsible for many of the chemical's fascinating properties.

"Heterogeneity seems to play a pivotal role, and the molecular species within eumelanin interchange between each other along excited state chemical pathways. However, the final structural heterogeneity is retained, and therefore, eumelanin can absorb all of that light and quench it without too much damage to its own structure," explained Ghosh.

"The benefit of computational studies is the ability to create a plethora of different structures of eumelanin, thereby emulating the natural heterogeneity in its structure and being able to find the properties of each substituent part," she added.

Ghosh pointed out that with improved knowledge about the structure-function relationship in eumelanin, there are already quite a few efforts toward engineering eumelanin-based materials with desired properties, such as semiconductors and supercapacitors.

For more details, please contact Dr. Debashree Ghosh (pcdg@iacs.res.in).

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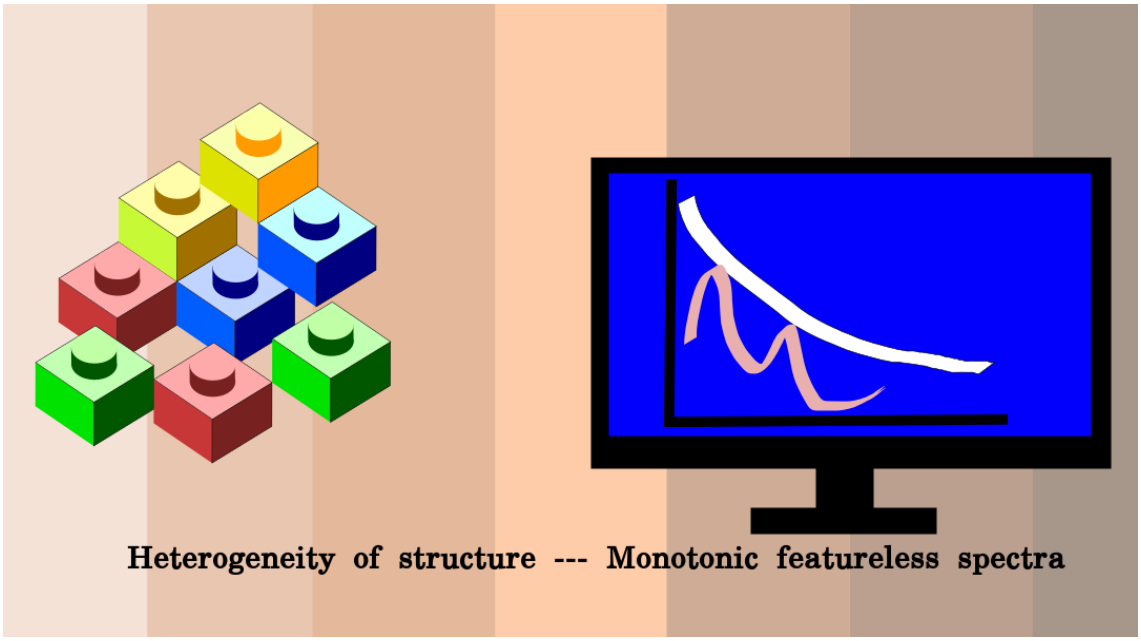
Heterogeneity of structure --- Monotonic featureless spectra