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Research highlight

Carbon nanotubes as lipid sensors

Researchers have discovered that single-walled carbon nanotubes (SWNTs) can sense and discriminate between different lipids in biological samples.[1] Such properties could lead to diagnostic kits for lipid profiling in the future.

The researchers set out to explore the reactions of unmodified SWNTs to different lipid molecules. For this, they took lipids and SWNTs in capillary tubes, then irradiated the lipid part, SWNT part and SWNT-lipid interface with three fluorescent lights: ultraviolet (UV); blue; and green.

Sophisticated imaging techniques including fluorescence microscopy were used to study the migration of the SWNT-lipid interface. These experiments were undertaken using two lipid molecules — lecithin and dipalmitoyl phosphatidylcholine (DPPC). The results indicated a marked distinction between interface movements for the two lipid molecules.

Lecithin has a linear hydrophobic tail that entered into the hydrophobic cavity of the SWNT, with the attraction caused by van der Waals force resulting in molecular diffusion. As DPPC has branched hydrophobic tails, SWNTs experienced a hydrophobic pull from the two tails of this lipid molecule.

This happens because lipid molecules have a polar head and a hydrophobic tail. SWNT, on the other hand, has a super-hydrophobic core causing a drag that brings the lipid tail closer to the SWNT core.

The researchers say that the insights into solid-state interactions between SWNTs and lipids may lead to a novel approach for sensing lipids.

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References

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