Adding water increases effectiveness of sunscreen

July 8 2014

Researchers at the University of Amsterdam have established that a common protective ingredient in sunscreens reacts differently to UV radiation than previously assumed. This leads to a decreasing efficacy and might induce harmful side effects. The Amsterdam chemists also found that adding some water can solve the issue, ultimately leading to a more effective sunscreen. They have just published their results in the *Journal of Physical Chemistry Letters*.

By applying state-of-the-art molecular spectroscopy researchers at the Van 't Hoff Institute of Molecular Sciences have investigated the behaviour of the octyl methoxycinnamate (OMC) molecule, a common sunscreen ingredient used for blocking UV-B radiation. They made the remarkable discovery that after the absorption of the UV-light the OMC molecule does not directly dissipate the extra energy in the form of heat. Instead, it stays in an excited 'dark' state for an extended period of time.

According to professor Wybren Jan Buma, heading the Molecular Photonics research project, this implies that the OMC molecule is prone to displaying undesirable reactivity. Indeed, chemists of the University of California at Riverside already have published research on the formation of active oxygen species in UV-radiated OMC-containing sunscreens. 'Our research provides a nice explanation for this phenomenon', says Buma Just add water The researchers expect that reducing the reactivity of OMC would lead to a better UV-blocking capacity. In their article in the *Journal of Physical Chemistry Letters*, published online last week, the UvA researchers present a way to do just

that.

PhD student Eric Tan, who performed the research together with laser engineer Michiel Hilbers, discovered that the presence of water molecules facilitates the OMC molecule in returning instantly to its stable electronic ground state. This means that adding water to the sunscreen formulation should significantly add to its performance. For this the researchers propose to employ reverse micelles that make it possible to 'embed' nanodroplets of polar water in the predominantly nonpolar sunscreen mixture.

More information: Eric M.M. Tan, Michiel Hilbers, Wybren Jan Buma: "Excited state dynamics of isolated and microsolvated cinnamate-based UV-B sunscreens," *J. Phys. Chem. Lett.*, 2014, 5, pp 2464–2468 DOI: 10.1021/jz501140b

Provided by Netherlands Organisation for Scientific Research (NWO)