

## Impact of Physicochemical Properties on Skin Absorption of Manufactured Nanomaterials

Supporting/Contributing Agency: U.S. EPA

The wide applications of manufactured nanomaterials will create enormous human exposure and environmental release. How our skin can protect the body from nanomaterials is of importance. This research is to study the skin absorption of nanomaterials for their safety evaluation and risk assessment. A novel method was developed to prepare water soluble fullerenes (nC60) that provides a yield 100 times higher than the current THF (tetrahydrofuran) method, which has led to many false reports on nC60 toxicity. Skin absorption of nC60 and the ion-pairing effects were studied (Xia 2007).

Pristine fullerenes (C60) in different solvents will be used in many industrial and pharmaceutical manufacturing, processing and derivatizing processes. The impacts of solvent effects on skin absorption of fullerenes were investigated using an *in vivo* tape-stripping method. The depth distribution of fullerenes in the stratum corneum was obtained. After 26 tape-strips, significant fullerenes were detected in the skin tissue of the dose site after 26 tape-strips (Figure). This is the first direct evidence that pristine fullerenes penetrated deeply into skin.

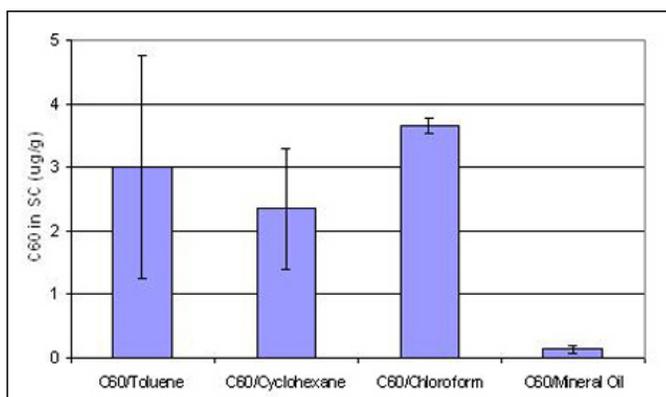


Figure. Solvent effects on skin absorption of C60 *in vivo*.

It was observed that fullerene contaminants on skin could not be removed by water or soap water washing. Solvents such as toluene can dissolve the fullerene contaminants but also accelerated their skin absorption. This study identified that fullerenes were not absorbed into skin from mineral oil. Therefore, mineral oil could be an effective solvent to remove fullerene contaminants from skin, which will not enhance further skin absorption (Xia 2009).

### References/Publications

- Xia XR, Monteiro-Riviere NA, Riviere JE. 2008. Ion-pairing effects on skin absorption of charged nanoparticles. *The Toxicologist CD—An official Journal of the Society of Toxicology*, 102,S-1, 1028, p.211.
- . 2009. “Skin absorption of pristine fullerenes from industrial organic solvents.” (Forthcoming presentation at the 2009 Annual Meeting of the Society of Toxicology.)