

# Evaluation of dispersed single-wall carbon nanotubes produced by “floating catalyst”-method

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The unique physical and mechanical properties of SWCNTs which can be regarded as graphene sheets rolled-up to a seamless cylinder have great potential for many different applications. However, the currently available CVD methods do not provide the desired agglomerate free SWCNTs which exhibit unperturbed electronic properties that are of great importance for applications such as composites. Moreover, it would facilitate the subsequent processing steps towards stable SWCNT dispersions. A major obstacle to such efforts are the strong van-der-Waals forces between individual rods which lead to bundling and agglomeration. Therefore processing methods which involve high energy inputs are used to individualize carbon nanotubes, often in combination with solvents or aqueous surfactant suspensions.

The “floating-catalyst” method with an optimized riser reactor design produces well dispersible SWCNTs. Sonication of the as-prepared product in aqueous solutions with surfactant molecules lead to an effective individualization of SWCNTs as proven by UV-Vis spectroscopy, atomic force microscopy (AFM) and multi-wavelength analytical ultracentrifugation (AUC). Stable solutions were investigated by Statistical Raman spectroscopy after dip coating, which revealed detailed information about SWCNT content and their electronic properties. Overall, the degree of individualization of the non-purified SWCNTs in a 2 wt.% aqueous solution of sodium cholate increases as the catalyst concentration is reduced in the gas phase. Moreover, the shortening of SWCNTs induced by higher ultrasound energy and sonication time has been investigated.

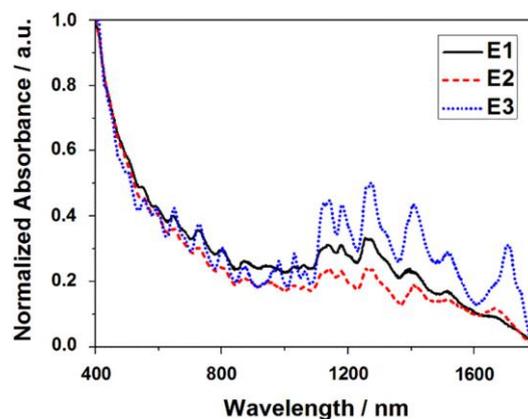


Figure 2. UV-Vis absorbance spectrum of SWCNTs in aqueous dispersion (D<sub>2</sub>O) with 2wt.% sodium cholate.

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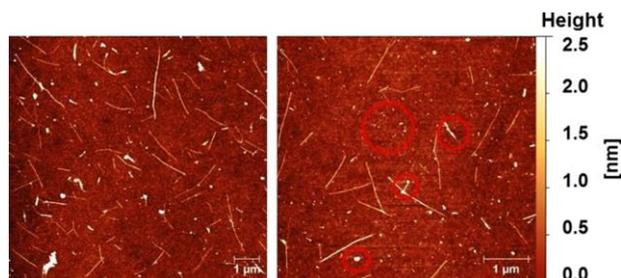


Figure 1. AFM images of dispersed SWCNTs on Si-wafer.