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Mass production and quality control techniques of graphene-related application products

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Nanotechnology is the understanding and manipulation of matter at the atomic and molecular level, where unique phenomena enable novel applications. Recent advancements on graphene, the well-known nano-material with extreme thinness, high electrical conductivity, high thermal conductivity, high mechanical strength and extreme-large specific surface area of materials, holds promising for broad potential applications. However, their mass production process, defect inspections, and quality control techniques and quality management standards have yet to be reached. Often the top-down manufacturing approach, involving cutting and shaping large materials to contain smaller identical features, face severe difficulty in reproducibility; while the bottom-up approach, involving piecing together small units into a larger area/size of product, face serve difficulty in defect predictability. In this paper we survey key quality matrix and measurement techniques for different applications, and how we possibly extend the results to a standard quality management framework. We describe how we characterize and measure the key product features for enabling effective mass production and quality control of graphene-based thermal films as an illustrated example.

Biography

Kung-Shiuh Huang (BS Physics NTU, MS EE Caltech, PhD EE USC) is currently associated with Academia Sinica, working on Graphene Thermal Film project, jointly with AzTrong Inc. He held positions as CTO of AzTrong, Technical Leader/Sr. Manager of Cisco, CTO/CEO of Chicony Software/EdgeWave, Director of Xirlink, Chief Scientist of Who? Vision System, Principal Engineer of Rockwell, and Research Staff of IBM. His research interests include graphene/graphite application products, thermal management solution, system design for communications, electronics/optoelectronics, and Internet of things (IoT) with smart sensing. He published a technical book, more than 40 papers, and more than 20 patents/inventions.

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PEG based lopinavir nano-conjugate for HIV pediatric treatment

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The development of effective drug delivery approaches for Human Immunodeficiency Virus (HIV) infected children are a global challenge. Lopinavir is one of the first-line anti-HIV drugs used in South Africa (SA) for children as a combination therapy with ritonavir. The drug suffers from low aqueous solubility (0.01mg/mL) which leads to a limited oral absorption and low bioavailability. Polyethylene glycol-lopinavir (PEG-LPV) polymer-drug conjugate was synthesized to improve the solubility and half-life of the drug. Conjugation and drug loading was confirmed by NMR spectroscopy. The conjugate was then evaluated for aqueous solubility, particle size, and surface morphology. In addition, the *in vitro* drug release was also studied. A major improvement in the aqueous solubility of LPV was achieved when conjugated to PEG. The conjugate showed a sustained release which would reduce the frequency of drug administration to the children compared to the current free drug regimen. The results of the study offer an alternative in the near future for the the pediatric antiretroviral therapy in SA.

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