



The Chinese University of Hong Kong
Non-confidential Abstract of Technology Disclosure

Title:

Carbon Nanotubes/chitosan Composite Coating on Springs for Enhanced Mechanical Properties

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Inventor(s):

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Patent Status:

- ◆ Chinese Patent Pending

Non-confidential abstract:

This invention relates to a novel method of preparing single-layered and multi-layered functional carbon nanotube (f-CNT)/chitosan composite coating on metallic mainsprings by electrochemical deposition. In particular, the present invention relates to a novel technology to prepare a f-CNT/chitosan composite coating with a polyelectrolyte polymer, that was found to significantly improve the mechanical properties of the mainsprings. Metallic mainspring plays a crucial role in the overall performance of many miniature devices by acting as an energy generator that provides the energy required for all energy consuming processes within the device. A typical example is the mainspring in a mechanical watch movement. A type of mainsprings that can offer higher energy, but longer life time with a limited physical dimension can undoubtedly upgrade the technical performance of the device that relies on the mainspring for energy generation and storage. Therefore, it is very vital to fabricate high-performance mainspring with enhanced mechanical strength. Since the first discovery by Iijima, carbon nanotubes (CNTs) have been of great interest. CNTs possess many unique properties, such as excellent electrical conductivity, chemical stability, and exceptional high mechanical strength (e.g., extremely high module and stiffness). These remarkable mechanical and electrical properties endow CNTs with a wide range of potential applications. Many methods have been used to prepare strong bulk CNT composite materials that possess improved mechanical strength. The bulk materials need to be machined into different dimensions and shapes for practical use. From this point of view, coating of CNT composite materials does allow more flexibility in preparation and wider application scope. The present invention excels other coating methods in several aspects. We have developed a single-layer (SL) strategy and a layer-by-layer (L-B-L) strategy to fabricate single-layered and multilayered f-CNT/chitosan composite coating and preliminarily studied its Young's modulus. It was demonstrated that such a f-CNT/chitosan composite coating can increase the Young's modulus of a stainless steel mainspring by more than 40%.

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