Nanotubes in Silicone Upgrade Healthcare Devices

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New highly flexible, soft, conductive silicone electrodes with nanotubes meet requirements for healthcare devices. The ultra-low dosage and exceptional properties of graphene nanotubes avoid the drawbacks common with other conductive additives for silicones. The efficiency of the new technology is proven by successful cases across the world, including flexible electrodes and sensors, and electronic impulse massage devices.

The electronics industry related to healthcare is experiencing significant growth with huge potential in coming years. Various wearable devices, monitors, and sensors are becoming more and more essential in daily life. They require the use of innovative materials that can conduct electrical current, but at the same time must be elastic, soft, and comfortable to touch. Silicone would be an ideal choice for conductive electrodes if not for its insulative properties. And until recently, traditional conductive additives, such as carbon black, metal fillers, or carbon fibers, set back the development of healthcare devices, as they have significant impacts on silicone's flexibility, hardness, processing, purity, and overall pricing.

A Chinese producer of polymer compounds has developed a material to fulfill specific requirements for production of flexible electrodes and sensors made of silicone rubber. Introducing graphene nanotubes by OCSiAl to silicone made it possible to combine a volume electrical resistivity below 10^2 Ω•cm with low hardness and high elasticity. Importantly, the innovative silicone compound does not leave marks on contact with skin, and it is produced without the dust that is typical for the use of carbon black as a conductive additive.

Another development that has already hit the market is an electronic impulse massage device, where graphene nanotubes introduced into HCR silicone gave the rubber volume resistance of <300 Ω with no carbon release to the surface, maintained mechanical properties including softness, and a standard production process.

"Graphene nanotubes have a greater length-to-width ratio than any other material. Together

with their super-conductivity and strength, this allows nanotubes to form electrically conductive 3D networks inside elastomers. The 0.01% working dosage, which is tens or even hundreds of times lower than that of other additives, is the key advantage of TUBALL graphene nanotubes. Our partners can now manufacture flexible, soft, but conductive silicone compounds, with a reduced price of properties. A striking example is the recently launched cyber hand prostheses with a 10 to 15 times reduced cost for a touchscreen use function thanks to conductive silicone fingertips with graphene nanotubes," said Ekaterina Gorbunova, Development and Support Leader for Elastomers, Vice President, OCSiAl Group.

Nanomaterials are leading to the emergence of consumer products with a new set of properties. OCSiAl takes a proactive approach in improving the accessibility of information on the nature of graphene nanotubes – so far, about 20 environmental and health studies of TUBALL nanotubes have been conducted. Tests show no corrosivity or irritation to skin, no potential for skin sensitization, and no acute dermal toxicity. In addition, TUBALL nanotubes are approved for large scale commercialization by the chemical authorities of Europe and the United States.

Read the original article on Industry Today.