



Very Small Nano-Carbon-Composite Gear Developed

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An extremely small gear mechanism using a nanocomposite material of nylon and vapor-grown carbon nanofiber (diameter: 100-200 nanometers) has been developed jointly by Prof. Morinobu Endo, Faculty of Engineering, Shinshu University; Showa Denko K.K. (SDK), Kitagawa Industries Co., Ltd. in Nagoya; and Seiko Instruments Inc. in Chiba.

The vapor-grown carbon nanofiber used in the composite, which was developed jointly by Prof. Endo and SDK, is now commercially produced by SDK with trade name of VGCF. For the development of the gear mechanism, Kitagawa Industries has contributed its proprietary compounding technology while Seiko Instruments has provided microparts design/production technology through its experience as a world-famous watch maker.

The gear mechanism is the smallest in the world based on the current production technology: measuring 0.2 mm in gear diameter, 0.025 mm in module, 0.09 mm in shaft diameter and having six cogs. The gear mechanism drives a gear for the second hand of a watch by way of an intermediate gear made of the same nanocomposite material.

The nanocomposite material is characterized by the ease of injection molding of microparts due to the mixing of carbon nanofiber, ensuring reproduction of delicate shapes. Also, the gear mechanism thus obtained has excellent mechanical properties, including high resistance to abrasion and heat as well as good sliding and antistatic performances.

The parties to this joint development will strengthen their cooperation further by combining the technology with their respective core competencies and broadening the applications. Specifically, the targeted fields include precision equipment (PC, OA equipment, etc.), medical equipment and automotive parts.