Study of Carbon Composites in Various Applications

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Carbon composite materials generally have excellent tensile properties, low densities, high thermal and chemical stabilities. Carbon fiber may be used for forming flexible composite sheets with the high strength to weight ratio. For experimental purposes carbon fiber/epoxy composite cylindrical sheets with discretely changed curvature of a surface were fabricated. The curved composite sheets with the longitudinal and cross steady states, at the alternate assembling in a package are forming bi-stable hinge, characterized with double-well potential. Such packages can find application in a space based unfolding designs. Experimentally we proved possibility of application of such kinematic pair, in which there is no rubbing surfaces when the kinematic pairs' parts are in relative movement, and accordingly, the friction absence among them. As an example of such design we made deployable solar panels with an original support framework. We also investigated bi-layer composites of Brass and unidirectional Carbon woven. The thermal expansion coefficient of these substances differs nearly ten times. Therefore this composite is suitable as "working body" of a "Heat Engine". Such engine directly transforms thermal energy into rotary kinetic energy. Bi-layer composite sheets with small weights on their ends, are fixed on rotor as blades of turbines and balanced. Due to thermal deformation under sunlight (lighting of the powerful lamp), center of the mass is displaced from geometrical center of rotor. Thus it creates force of torque and makes construction to rotate. On the lower part of the engine the working body is cooled, providing cyclic operation of such engine.

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