WEDNESDAY MORNING, June 22

SMS-21: Crack-healing Ability and Behavior of Alumina Strengthened by SiC Particles and SiC Whiskers
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This study aims a development of new alumina composites having high fracture toughness and excellent crack-healing ability. For this purpose, Al2O3/30 vol% SiC whiskers and Al2O3/20 vol% SiC whiskers/10 vol% SiC particles multi-composites were developed. Al2O3/20 vol% SiC whiskers/10 vol% SiC particles multi-composite having 1.43 times higher fracture toughness than monolithic alumina was found to be able to heal the pre-crack below 250 μm in surface length. Also Al2O3/30 vol% SiC whiskers composite having 1.65 times higher fracture toughness than monolithic alumina was found to be able to heal the pre-crack below 200 μm. In spite of the same SiC content, SiC particles and SiC whiskers multi-compositing enlarged the limit crack size to be able to crack-heal. However, increasing SiC whiskers content enhanced strength recovery of the specimen with the large crack above limit crack-size.

SMS-22: Fabrication of Metallic Micro-Closed Cellular Materials
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Some methods to fabricate the metallic closed cellular materials have been developed. Powder particles of polymers coated with a nickel-phosphorus alloy layer using an electro-less plating method were pressed into pellets and sintered at high temperatures by a furnace and a spark plasma sintering (SPS) system. Metallic closed cellular materials containing different materials from that of cell walls were then fabricated. And the cell size of these materials is about 10 midro-meter. The physical and mechanical properties of these materials were measured. The density of these materials is same as that of aluminum. The results of the compressive tests show that this material has the different stress-strain curves among the specimens that have different thickness of the cell walls and the sintering temperatures of the specimens affect the compressive strength of each specimen. Also, it seems that the results of the compressive tests show that this material has high-energy absorption and Young's modulus of this material depends on the thickness of the cell walls and the sintering temperature. The internal friction of this material was measured and the results show that this internal friction is same as that of pure aluminum. These obtained results emphasize that this material can be utilized as energy absorbing materialand passive damping material.

SMS-23: Characterization of the Liquid-phase Synthesized Fullerene Nanotubes and Nanowhiskers
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Short fullerene nanowhiskers (SFNWs) have been successfully prepared by the ultrasonic liquid-liquid precipitation method. The SFNWs have lengths less than about 1000 nm and aspect ratios less than five. The C70 nanotubes heat-treated at high temperature in vacuum became amorphous carbon nanotubes, retaining their tubular structure. These new nanocarbons should find wide application for composites materials, battery electrodes and so on.

SMS-24: Development of a Real-Time Table Tennis Scoring System
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This paper presents design and development of a computerized sensing and scoring system for table tennis games. The proposed system consists of piezo film sensors, data acquisition system, interface software and electronic score board. Piezo film sensors were employed to detect the ball on the line, edge and net. The table was equipped with piezo film sensors that provide the primary input to the system. These sensors were connected to the PC by data acquisition hardware. A referee interface software was developed for windows environment through which the referee interacts with the system. The software also generated output to drive an electronic score board. With the aid of the proposed system, the referee is expected to accurately detect high-speed balls on the line, edge and on the net.

SMS-26: Crack Detection of Filament Wound Tank Using Embedded Small-diameter FBG Sensors
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Composite propellant tanks are widely used for spacecraft. We embedded and integrated small-diameter fiber Bragg gratings (FBG) into a composite filament wound tank as a health monitoring sensor. In recent years, many researches on the health monitoring technology are carried out using FBG sensors. Especially, small-diameter FBG sensors have many advantages in comparison with other sensors. This small-diameter FBG sensor is 52 micrometers in diameter, one-third of a conventional FBG sensor, and easy to embed in the tank. FBG sensors usually used as strain or temperature sensors. In addition, embedded small-diameter FBG sensor can detect a non-uniform strain distribution around microscopic damages that occur in the composite tank. In this research, small-diameter FBG sensors were embedded in the hoop layers on the border of the helical layers. We then conducted the real-time strain and temperature measurement during both the cure process and the pressure test. Furthermore, crack detection was attempted during the pressure test.