PCS mixture at temperatures between 1000 and 1800 °C under a pressure of 120 MPa. The effect of processing temperatures on the mechanical properties of the composites was examined by conducting three-point bending tests. For comparison, SWCNT solids were also prepared without addition of PCS. In the case of the SWCNT-PCS composite prepared at 1000 °C, the specific strength and specific modulus were about two and four times higher than that of the binder-free SWCNT solid, respectively. The reason for the increment is believed due to the stable PCS links formed between SWCNTs within and between the bundles.

**PMC-11: Effect of Loading Rate on Mechanical Properties of CFRP Laminates**

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In the present study, effect of loading rate on the mechanical response of CFRP laminates is evaluated experimentally. Both unidirectional and cross-ply laminates are evaluated under both on- and off-axis tensile loading. For the nonlinear mechanical behavior in the unidirectional laminate under off-axis loading, the validity of the one-parameter plasticity model is demonstrated. For the cross-ply laminates, it is shown that the stress-strain relation is also nonlinear which can be well modeled by a nonlinear elasticity model. The stress-inelastic strain relation can be well described by the zero-parameter plasticity model. The effect of loading rate on the stress-inelastic strain relations for both the unidirectional and the cross-ply laminates is characterized by the change in the model parameter and the effective stress-effective plastic strain relation.

**PMC-12: A Rapid Cure Epoxy Resin System for RTM Process**

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A new epoxy resin system for a RTM process has been developed to improve production rate of carbon fiber reinforced plastics (CFRPs). The resin system, composed of an anionic polymerized epoxy resin with a chain transfer agent exhibits both longer flow time (3.5min) for impregnation and shorter cure time (6.0min). The cured resin of the resin system has high mechanical properties, such as tensile modulus (3.8GPa), tensile strength (79MPa) and fracture tensile strain (4.1%). With the resin system, a flat CFRP panel, having size of 35cm x 70cm x 2mm (thickness) and fiber volume fraction of 52%, was successfully fabricated in 8 minutes by an isothermal RTM process at the temperature of 105°C. Mechanical tests of the CFRP panel result in high tensile strength (650MPa) and compression strength (600MPa). Also, Tg measurement of the CFRP panel result in high Tg (116°C). These results demonstrate that the resin system is practical for automobile outer panel production.

**PMC-13: Characteristic of Nonlinear Viscoelastic Behavior in Vinylester Resin**

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This study investigates the nonlinear viscoelastic behavior in vinylester resin. The Schapery model is one of constitutive equations that express the nonlinear behavior in polymeric materials and Papanicolaou and Zanakis proposed the methodology to determine the nonlinear parameters of the model by creep-recovery tests. However, unrecoverable strain related to permanent deformation has almost never discussed in these articles. In this study, the nonlinear parameters were determined by the creep-recovery tests and the irreversible strain was formulated. It was found that the unrecoverable strain was nonlinear and it had threshold stress value between the linear and the nonlinear behavior same as the other parameters in the Schapery model. Creep recovery tests, a multiple step creep test, and tensile tests, in which strain rate was changed as time-dependent factor, were performed to discuss the validity of the proposed model taking into account irreversible strain. Fine agreements between experimental results and theoretical curves were found and it was confirmed that the proposed model could predict strain response accurately, even in high stress region, on a consideration of nonlinearity and loading history.

**PMC-14: Stress Wave Method for Identification of Viscoelastic Material Property Based on Finite-element Inverse-analysis**

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A new approach based on the inverse analysis is proposed for identification of the viscoelastic material property. The material property is inferred from the data of the viscoelastic response at a measurement point. The stress at the measurement point is computed by the finite element method for an assumed viscoelastic material constants. The assumed viscoelastic material constants are iteratively updated by minimizing the stress discrepancy between the calculated one and the one obtained by a convolution integral of the material function and the measured viscoelastic response. In each iteration, the stress is updated by the finite element analysis, and the viscoelastic material constants are updated by the Gauss-Newton method that minimizes the stress discrepancy. A detailed finite element simulation is performed to demonstrate the effectiveness of the proposed method. The effects of the data initialization, the loading duration and the wave reflection are also examined. It is concluded that the proposed method can accurately estimate the viscoelastic material constants.

**CAS-07: Modification Mechanism of Rare-earth Element in Hypereutectic Al-Si Alloy**

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Abstract: There are different views about the modification mechanism of rare earth element on the microstructure, especially on the primary silicon of hypereutectic Al-Si alloy. In the paper, the modifying effect of the rare earth cerium (Ce) on the hypereutectic Al-Si alloy under different casting states has been studied by using of Optical Microscope and Quantitative Image Analysis. It is found that the size and the quantity of primary silicon in castings decrease with the added content of Ce in the melting. Meanwhile the primary silicon changes from branched shape to fine faceted shape. On the other hand, although the modifying degree on eutectic silicon in castings also increases with the added content of Ce, the effect on the eutectic silicon away from primary silicon is more obvious than that the eutectic silicon close to the primary silicon. The modification mechanism is analyzed in detail by means of Scanning Electron Microscope Equipped with Energy Dispersive Analysis of X-Ray and thermodynamics analysis, which includes the analysis on the change in Gibbs energy of reaction and reaction equilibrium.

**CAS-08: Developing Dies for Thixoforming 7075 Wrought Alloy**

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To produce high quality of thixoformed 7075 alloy, some critical design and process parameters must be controlled. Process parameters include partial reheating of billet, injection speed, forging load and solidification time. This study examined the importance of die materials of thixoform-