TUESDAY AFTERNOON, June 21

thermal component and strain rate obtained from experiments for alpha-
iron and the temperature-strain rate parameter (Larson-Miller parameter) were used with thermal activation theory. The prediction was successfully performed and they show that stress-strain behaviour at high strain rates can be estimated from quasi-static data with reasonable accuracy.

IMP-08: Effects of Bake Hardening Property on Dynamic Yield Strength of Ultra High Strength Sheet Steels

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The application of high strength steel for automotive body parts, especially pillars and cross members is one of the most effective methods both reducing the weight of automobiles and safety. Generally, the higher yield strength of steel sheets contributes to crash energy management. It is important to measure the dynamic yield strength correctly in order to evaluate the crash energy absorption property. However, it is difficult to measure the yield strength under dynamic loading condition. In this study, the tensile tests were carried out to determine the accurate yield strength on the ultra high strength sheet steels under dynamic loading condition. Four kinds of steel sheets with various strength levels are selected for this study. The dynamic tensile properties are measured with the split-Hopkinson bar apparatus at the strain rate of 1000 /s. Moreover, it is evaluated the effects of bake hardening (BH) treatment on the dynamic yield strength, because the influence of BH treatment on the yield strength has not been adequately clarified under dynamic loading condition. BH treatment is done in some samples at 443K x 1200sec. The effects of BH property on the strain rate dependence of the yield strength are discussed in the ultra high strength steel sheets.

Coffee Break

16:00 p.m. - 17:30 p.m. Room A

SMS-11: Smart Materials and Structures, NDE

SMS-09: Thermomechanical Properties of Shape Memory Composites

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The shape-memory composite belt with a TiNi-SMA wire fiber and a polyurethane-SMP sheet matrix was fabricated. The bending actuation characteristics of the belt were investigated by the thermomechanical tests. The results obtained can be summarized as follows. (1) Residual deflection close to the maximum deflection is obtained by cooling under constant maximum deflection. The residual deflection disappears by heating under no load. Both the rate of shape fixity and the rate of shape recovery are close to 100%. (2) Recovery force appears by heating under constant residual deflection. The recovery force is 93-94% of the maximum force. The development of high functionality of shape-memory composite elements is expected by various combinations of SMAs and SMPs.

SMS-10: Fabrication, Characterization and Modeling of Porous NiTi Shape Memory Alloy

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Porous NiTi shape memory alloy with several porosities are processed by Spark Plasma Sintering (SPS) method. The compression behavior of the porous NiTi was examined with the aim of using it as a high energy absorbing material. Two models for the macroscopic compression behavior of the porous NiTi are proposed. The analytical results are compared with the experimental data for porous NiTi with 13% porosity, resulting in a reasonably good agreement.

SMS-12: Shape Morphing Truss Structure for Aerospace and Marine Applications

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One of the goals in shape morphing technology is to cause surfaces to displace even when resisted by large pressure loads (or heavy weights). The challenges become especially demanding when minimum weight requirements and power budgets are imposed. This challenge can be addressed by seeking structures that are simultaneously statically-determinate, yet stiff. Applications of such structures range from the aerospace and marine sectors to optical devices. Sensing and control circuitry facilitate a structure suitable for high-ampitude large-force vibration or displacement control. A concept for a high authority shape morphing plate design incorporates an active back-plane comprising a Kagome truss, capable of changing the shape of a solid face, connected to the back-plane by means of a tetrahedral truss core. The most important benefit of the Kagome based structure results from its ability to attain several target shapes equally well while using only one configuration of actuators. The design is performed by a combination of analytic estimation and numerical simulation, guided by previous assessments of the Kagome configuration. An optimization based on a genetic algorithm has been used to determine the best placement of a limited number of actuators in the structure for a given set of target shapes. The force capability of the actuators and failure threshold loads of the structure were observed in the optimization. Possible applications of such a multi-shape morphing structure are ailerons or mirrors.