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"Homogenizer" is a device to obtain homogeneous emulsion without any fluid separation. The homogeneous disk-parts of the system of the fluid particle like in cocoa are apt to be damaged to erosive wear by the impact of the fluid. Therefore, it is important to investigate and develop materials in order to control this wear phenomenon. The spherical carbides stainless steel casting showed the most appropriate quality as a wear-proof material. On the other hand, the SPS discharge plasma WC sometimes produces a crack or cracks from the characteristic quality of WC during creation, so that it cannot be said to be so good a quality. Furthermore pursuits of reproducibility of experiments of spherical carbide stainless steel casting and the confirmation of the possibility as wear-proof materials will lead to the feasibility of this material.

8:30 a.m. - 9:30 a.m.

Room B

SHORT ORAL PRESENTATION FOR POSTERS II

P19: Characteristic Behavior of Zr-based Metallic Glass under Rapid Heating and the Application to Microforming

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Superplastic forming of metallic glasses is useful for fabricating micro- and nano-devices. In the present paper, we developed a new production method based on the characteristic behavior of Zr-based metallic glass under rapid heating. This material exhibits Newtonian viscous flow between the glass transition temperature T_g and the crystallization temperature T_x . To explore these characteristics under rapid heating, we developed a new apparatus. Foil specimens were heated by an electric resistance heater, current was controlled by high-speed FETs, and the temperature was measured by detecting the thermal radiation with a PbSe element. During the heating, the temperature T_g and the temperature T_x increased with increasing heating rate. As an application of this phenomenon, characteristic microforming should be performed during rapid heating, at very high strain rates and under very low stresses. The newly developed microforming system consists of a rapid heating unit for the foil specimen, a unit for detecting the glass transition, and an electromagnetic specimen loading system. Using this apparatus, microforming was carried out within 30 seconds, including heating and cooling time. Thus, the system would be most effective in the mass production of micro parts for MEMS.

P20: Influence of Composition on Shape Memory Characteristics of Ti-Ni Alloys Fabricated by Pulse-Current Pressure Sintering

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The influence of fine TiH_2 powders on shape memory characteristics of Ti-Ni-Cu alloy fabricated by pulse-current pressure sintering method was investigated. Gas-atomized Ti powder and milled TiH_2 powder were used. In the case of Ti powder the solution-treatment results in decreasing in relative density, while in the case of TiH_2 powder the solution-treatment results in increasing in relative density, but decreasing in elongation. The tensile strength and elongation of the shape memory treated

alloy used Ti powder were more than 300 MPa and 5%, respectively. On the other hand, the tensile strength of the alloy used TiH_2 powder were more than 300 MPa, but the elongation of the alloy was about 2% and showed no yielding tendency even after shape memory treatment. The width between the transformation start and finish temperature of the alloy used TiH_2 powder becomes narrower. This means that the temperature-response improved by using of TiH_2 powder.

P21: TIG and YAG-Laser Hybrid Welder for Tailored High Strength Steel Sheet

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Tailored blanks (TBs) and high strength steel, called "Haiten," are key technologies in the development of lighter panel parts for automobiles. However, the material around the heat-affected zone (HAZ) tends to be weaker than other parts of the high-strength steel because of the slow cooling rate in TIG welding. The weakened area could become the cause of fracture in the next deep-drawing process. The laser welder provides an effective solution to this problem, due to its high power density and the fact that a small molten spot has a faster cooling rate. However, the laser process does not allow for a wide gap between welded parts because of its small molten spot. This has been a barrier to the realization of free-curve or multi-liner weld-lines in TBs of high-strength steel. In this paper, the authors describe a hybrid welder using TIG and YAG-lasers, allowing the TBs to accept a wider gap between the welded parts and preventing the materials around the HAZ from weakening. They report on the gap allowance and on the quality of the HAZ in high-strength steel.

P23: Development of a Palmtop Fatigue Testing Machine and the Characteristic Behavior of Microfabricated Thin Films

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One of most promising micromanufacturing process for MEMS parts is LIGA (Lithography and Electroforming) process. The LIGA process provides a wide latitude in designing geometries of microstructures, but the process is characterized by producing both the material itself and MEMS structure at the same time. Since, the mechanical properties of electroformed material such as Ni depended on the process condition. We newly developed a palmtop fatigue testing machine. The machine enables in-situ observation with a scanning electron microscope or optical microscope and facilitates both static and dynamic loading mechanisms, since a tensile strength and a fatigue strength are obtained. A voice coil motor is used as the loading mechanism and is supported by parallel plate springs. The displacement of the moving coil is measured with a linear voltage differential transformer (LVDT) installed in the loading unit. Tensile load is measured with a load cell and at a same time calculated using both the coil current and the displacement. Ni-specimen was fabricated by UV-LIGA (Ultra Violet ray Lithography) process and the thickness is 5, 10 and micrometers and the fatigue strength is about 35% of the tensile strength.

P24: Bonding of Magnesium Composite Material Using Superplastic Deformation

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Although the magnesium alloy with the excellent characters attracts attention as a next-generation metal, it is important to improve the corrosion-resistant due to stand severe use condition and to widely extend the implicated demand. Just until now, conversion treatment, anodic oxidation, and paint processing are used for magnesium alloy. But, the