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PRESS RELEASE (2016/04/08)

Successfully Develop Highly Formable Ni-based Superalloy (Required forming load is well below half of conventional)

Superalloy known as a typical hard-to-deform material was successfully modified to be an easy-to-deform material with a new processing technique developed by a research group of Zenji Horita, a professor of Kyushu University, Fukuoka, Japan. Collaborating with Nagano Forging Co., Ltd. in Nagano city, Prof. Horita reported that it is now possible to enhance the formability of the Ni-based superalloy which is used as a high-temperature heat resistant and good corrosion resistant alloy. Because the alloy has higher strength than forming tool at elevated temperature as well as low temperature, the improvement of the formability to required shapes has been an important subject for the industry providing automotive engine parts. This problem was solved by microstructural refinement to the nanometer levels using a technique of severe plastic deformation under high pressure, called High-Pressure Sliding (HPS).

The collaborating project between Kyushu University and Nagano Forging Co., Ltd. started three years ago, in 2013, receiving a support by subsidies for promoting manufacturing technology of small and medium enterprises from the Ministry of Economy, Trade and Industry (METI), Japan. The HPS process developed by the collaboration is useful not only to Ni-based superalloys but also to many light-weight metals like high-strength aluminum and titanium alloys and less ductile magnesium alloys. Prof. Horita says the HPS process should be a convenient tool to alter hard alloys to soft alloys when the formability is required to the alloys. He is sure that the new processing technology will contribute to saving energy and lower emission of carbon dioxides.

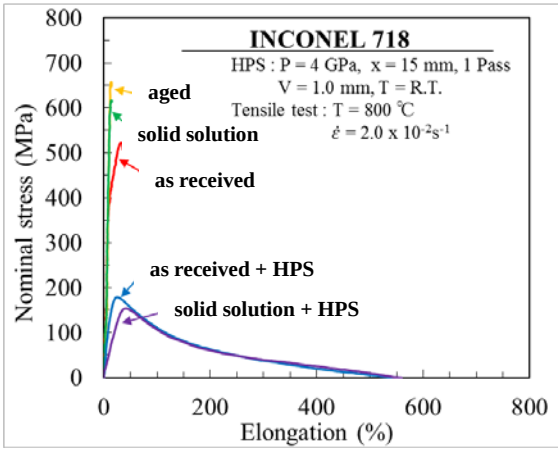

Fig. 1. Stress vs strain curves of hard-to-deform Ni-based superalloy (Inconel 718) after tensile deformation at 800°C with initial strain rate of $2x10^{-2}$ s^{-1}.

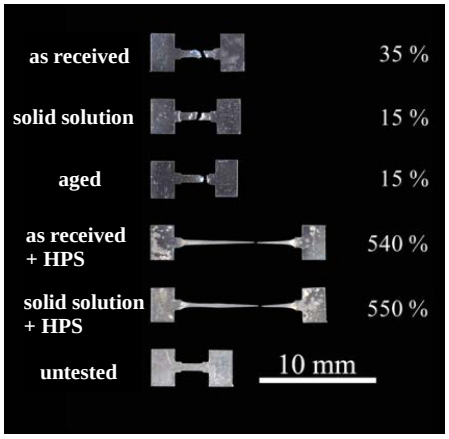

Fig. 2. Appearance of tensile specimens after tensile deformation at 800°C with initial strain rate of $2x10^{-2}$ s^{-1}.

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