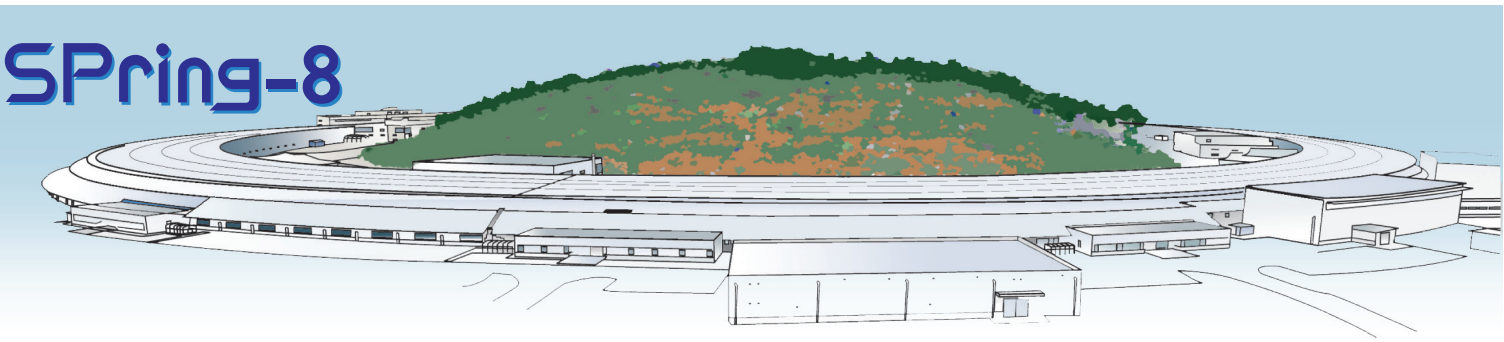

New Four-Dimensional Visualization Technique for Analyzing Destruction of Metal Materials

A research group led by Hiroyuki Toda (professor) of the Graduate School of Engineering, Kyushu University, developed a new four-dimensional (4D) visualization technique for analyzing metal structures using the world's most powerful synchrotron radiation facilities of SPring-8. 4D observation means three-dimensional observation over a continuous time axis. With this technique, how metals are deformed upon external loading and finally broken can be observed in detail four-dimensionally. Two-dimensional techniques have been mainly used for research and development of conventional materials. Recently, three-dimensional techniques have been partially used. Because actual phenomena occur four-dimensionally, research and development of materials used for transportation systems such as automobiles and airplanes is expected to markedly advance with the 4D visualization technique. The achievements in this research were published online in a prestigious international journal in the field of metal materials and engineering, *Acta Materialia*, August issue (No. 61), on 27 June 2013, prior to the printed version (15 July 2013).

Reference: "Grain boundary tracking technique: four-dimensional"
Hiroyuki Toda, Yoshikazu Ohkawa, Takanobu Kamiko, Takuma Naganuma, Masakazu Kobayashi, Kentaro Uesugi, Akihisa Takeuchi, Yoshio Suzuki
Acta Materialia **61** 14 5535-5548

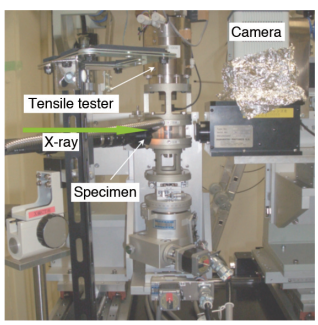

Fig. 1 Experimental setup using BL20XU beamline used for imaging

Fig. 2 Example of grain boundary tracking

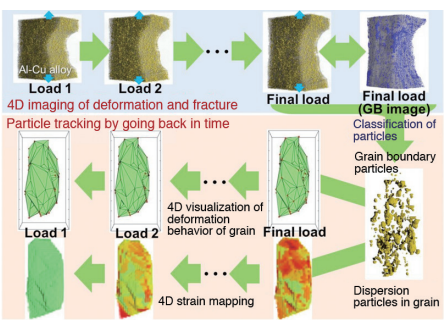

Fig. 3 Principle of grain boundary tracking technique

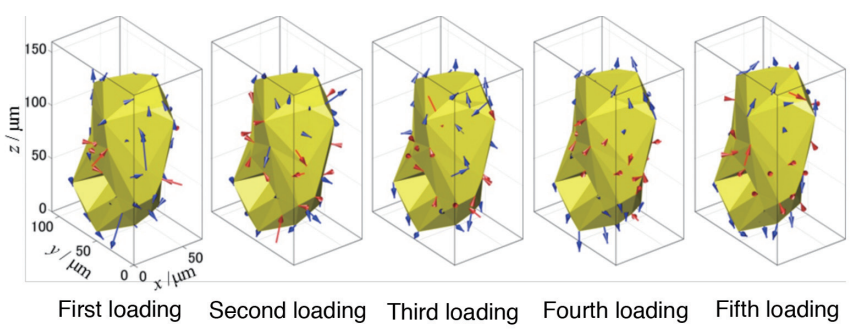

Fig. 4 Example of grain boundary tracking

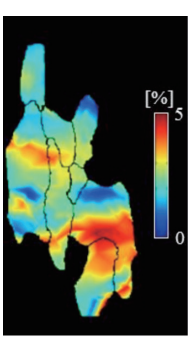

Fig. 5 Morphology of eight grains and their deformation behavior represented on virtual cross section

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