conferenceseries.com

European Congress on LASER, OPTICS AND PHOTONICS

May 23, 2022 | Webinar

Local Microstructure Control of amorphous alloys by utilizing ultrashort pulsed laser for improvement of machinability

Chieko Kuji

Tohoku University, Japan

Amorphous alloys have excellent soft magnetic properties due to their non-crystalline structure, thus they are expected to be used as motor core materials. On the other hand, due to their high strength and toughness resulting from their unique amorphous structure, they are difficult to machine causing high machining resistance and severe tool wear. The authors propose a new method to overcome this difficulty in machinability by heat-treating the alloy to slightly precipitate crystals, which reduces the tough mechanical properties and improves machinability1. However, crystallization of the entire alloy would also lessen the excellent soft magnetic properties, so it is necessary to crystallize only targeting local areas that contribute to machining. In this study, ultrashort pulsed lasers, which have few thermal effects, were purposely tried for heat treatment to perform localized heat treatment while suppressing thermal diffusion. Next, the microstructure after laser irradiation was examined by electron microscopy to determine whether the ultrashort pulsed laser could be used for heat treatment. Finally, machining tests were conducted to investigate how the machinability of the locally heat-treated samples changed. This research was partly supported by JSPS KAKENHI, grant number 20H02021. The author is also grateful to Professor T. Kuriyagawa, Professor H. Soyama, Professor M. Mizutani, and Assistant Professor K. Shimada for advising on machining tests. The author wishes to thank Professor T. J. Konno and Dr. K. Takenaka for evaluating the microstructure.

Biography

Chieko Kuji completed her PhD from Tohoku University in March 2022 while working for a company as an engineer. She is currently an assistant professor at the Department of Finemechanics, Graduate School of Engineering, Tohoku University. Her major research fields are (i) microstructural evaluation and machining of amorphous alloys[1], (ii) structural analysis of materials[2], and (iii) development of new dental treatment methods using powder jet machining[3, 4].