

Title: Femtosecond laser microfabrication via photothermal processes: from fundamental transient phenomena to applications

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Laser processing has emerged as a powerful technique for microstructure fabrication. In particular, femtosecond laser pulses are widely utilized for non-thermal processes such as laser ablation, two-photon polymerization, and precipitation due to their ultrashort pulse durations, which are shorter than the thermal diffusion time. Conversely, when operating at high repetition rates, femtosecond lasers can induce heat accumulation, enabling a novel class of microfabrication techniques based on thermochemical reactions. This lecture will introduce femtosecond laser direct writing of common metals via multiphoton absorption-induced thermochemical processes. The presentation will begin with a discussion of the fundamental transient phenomena involved in direct writing, focusing on the effects of different raw materials and laser parameters. This will be followed by application examples, including the fabrication of microdevices such as flexible electrochemical sensors, developed as part of the JSPS-DAAD Bilateral Program.