



THE UNIVERSITY of EDINBURGH

School of Engineering

IMP seminar

11:00-12:00 on 16th June 2023

HBB_Classroom 4

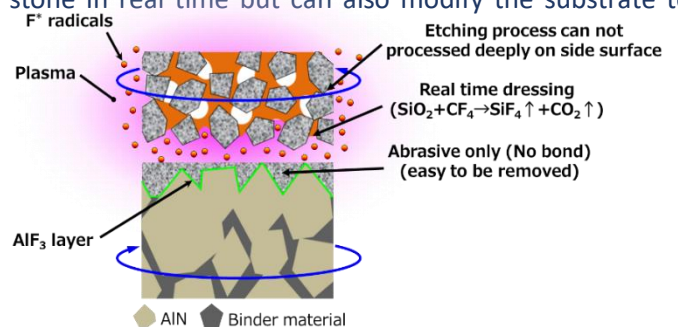
Highly-efficient plasma-assisted polishing technique with auto-dressing

Dr Rongyan Sun



ABSTRACT

Compared to conventional free abrasive (slurry) polishing, fixed-abrasive (grinding stone) polishing is more efficient because of the higher abrasive grain density. However, as the polishing process proceeds, grinding stones get loaded and cause a decrease in material removal rate (MRR). To regain high MRR, an additional dressing process that can expose new abrasive grains to the grinding stone surface is necessary, but it also makes the polishing process discontinuous and reduces overall efficiency. Many researches have been conducted on the self-sharpening of fixed abrasive grinding stones. Nevertheless, the self-sharpening of grinding stones is not efficient with ultra-low polishing pressure, which is not large enough to break bonds so as to expose new abrasives. Hence, a polishing technique that enables auto-dressing even at ultra-low polishing pressure becomes very attractive. In this study, a highly efficient auto-dressing dry polishing process was proposed, where it combines plasma-assisted polishing and plasma-assisted dressing using Ar-based CF₄ plasma and a vitrified-bonded grinding stone. As the main component of vitrified bond materials, silica was etched using CF₄ plasma, which is equivalent to the continuous dressing of grinding stone surfaces, makes a high MRR was maintained. Thus, a highly efficient auto-dressing polishing process was realized. Moreover, the CF₄ plasma irradiation increased the MRR twice, as CF₄ plasma can not only dress a grinding stone in real time but can also modify the substrate to make it remove easily.



SPEAKER

Dr. Sun is a researcher specializing in ultraprecision manufacturing techniques based on plasma. His educational journey began with a Bachelor's degree from Jilin University in 2015, and then he pursued a Master's degree from Osaka University in 2019. In March 2022, Dr. Sun achieved his Ph.D. degree in Engineering from Osaka University.

Since April 2022, Dr. Sun has embarked on an academic career as an Assistant Professor at Osaka University. Recognized for his contributions to the field, he was honoured with the position of affiliate member in the Japan Society for Precision Engineering (JSPE).