

Research Topic	Effects of laser energy deposition on a shock wave propagated on the grooves	Graduate School of Engineering
Host University	University of Glasgow / Glasgow / UK	Electrical, Electronic and Mechanical Engineering
Duration	From September 9 to December 17, 2019	MURAKAMI Hiromu

Summary of the Research Activities

The shock waves occurring around supersonic vehicles cause the increase of aerodynamic drag as well as noise. Various studies have been conducted to reduce aerodynamic drag due to the shock waves for example. A Laser energy deposition technique that plasma, a spherical shock wave, and a thermal gas are generated by a focused high energy laser beam is a possible option to control the shock waves. The induced thermal gas mainly causes shock wave deformation, which results in drag reduction. In this study, I investigated effects of laser energy deposition on a shock wave propagated on the grooves. To reveal the shock wave diffraction and interaction with the thermal gas, I visualized the shock waves using high-speed Schlieren photography. The flow visualization experiments were conducted with Indian Ph.D. student. I did not have experience of the laser focusing experiments, thus it took time to achieve a laser-induced ablation on the surface of the grooves. Figure 1 shows an experimental setup for laser energy deposition experiment. Using the laser focusing technique, the interaction between the shock wave and the thermal gas was successfully visualized. Figure 2 shows the visualization result of typical shock wave interaction with the grooves. We continue to investigate the study as an international research collaboration after I went back to Japan. Through the OIT overseas research experience program, I acquired a great experience about international research activities with foreigners. I really appreciate University of Glasgow and Osaka Institute Technology giving me the international research opportunity.



Fig1. The experimental setup for laser focusing.

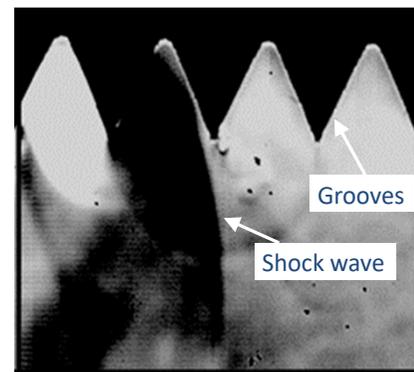


Fig 2. The shock wave on the grooves.

College Life, Friends and Others

University of Glasgow is fourth-oldest university in UK and has historical buildings. I often walked around campus and the Glasgow city centre at the weekend to see the historical buildings designed by architect, Charles Rennie Mackintosh. As there were many international students in an aerospace engineering lab where I visited, I could talk different cultures.



Fig 3. City landscape.



Fig 4. College courtyard.

指導教員講評

異文化について理解が深まり、充実した海外生活を過ごせたかと思えます。海外の研究経験を活かして、今後の研究の発展を期待しています。

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