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세션	코드	세션명
	W1G-I	광과학 I
좌장	이름	소속
	김명기	고려대학교

논문번호	발표시간	발표자	발표초록
W1G-I-1	2019-02-20 13:30	이한석	On-chip high-Q resonators based on chalcogenide glass and their applications
W1G-I-2	2019-02-20 14:00	김대곤	High-Q Chalcogenide Glass Microcavities for Low-Power Stimulated Brillouin Lasers on a Silicon Chip
W1G-I-3	2019-02-20 14:15	Yildiz Muhammed Kaan	Ultra-high-Q microtoroid resonators with embedded diamond color centers
W1G-I-4	2019-02-20 14:30	류지훈	**A simple approach for estimating the aging effects of pyrotechnic materials through detecting the ZrO molecular band signals via laser-induced breakdown spectroscopy (LIBS)**
W1G-I-5	2019-02-20 14:45	배리진	Transportation of relativistic electron bunches in thin foil targets irradiated by ultraintense laser

닫 기

세션	코드	세션명
	F2D-I	광과학 IV
좌장	이름	소속
	공수현	고려대학교

논문번호	발표시간	발표자	발표초록
F2D-I-1	2019-02-22 10:45	양준호	Double pulsed Raman-LIPS(laser induced plasma spectroscopy) system for space exploration at very low pressure condition
F2D-I-2	2019-02-22 11:00	김예슬	Label-free bio-sensing based on active nano-slot resonators in microfluidic circuits

닫 기

Double pulsed Raman-LIPS (laser-induced plasma spectroscopy) system for space exploration at very low pressure condition

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***Abstract*— This research proposes the attempt to obtain molecular and atomic signal simultaneously using scale-downed double pulsed laser system. We integrated Raman and LIPS into one optical instrument. Furthermore, we improved the LIPS signal intensity by generating twice plasma with a short delay time. Contrary on conventional double pulsed LIPS, the first plasma is transformed into smaller plasma so that it can be measured by Raman signal simultaneously. And, the second plasma is generated using relatively high laser energy. Finally, we derived chemical analysis of the reference rock samples using the double pulsed Raman-LIPS system.**

I. Introduction

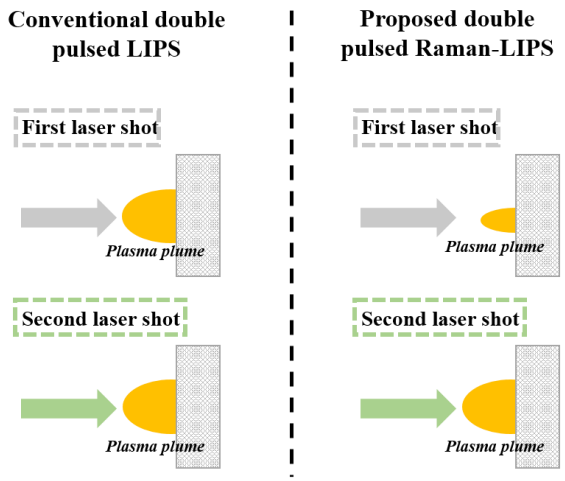
Laser-induced plasma spectroscopy (LIPS) is an atomic emission spectroscopic technique used in multi-elemental analysis. A pulsed laser which has higher than 10~100 mJ is focused onto a targeted sample. The many ablation points of the surface will generate a plasma in a few micro-seconds. The strengths of LIPS are high sensitivity, real-time analysis, high precision, and relatively simple compared with other optical spectroscopy. Since LIPS has the good ability to analyze the surface of targeted sample, it is used for space exploration.

However, plasma lifetime is affected by pressure. Moreover, plasma lifetime is directly related to the amount of light emitted from the plasma. Therefore, in case of space exploration under 0.01~100 torr, plasma lifetime is decreased or increased dramatically because of the rise in plasma expansion [(1)]. And, signal intensity of LIPS is decreased at very low pressure condition. These are problems that must be solved in space exploration using LIPS.

Raman spectroscopy is molecular scattering measurement to detect the vibrational and rotational motion. Due to inter- or intra-molecular interactions, induces the phenomenon of stoke scattering of laser. For this reason, Raman spectroscopy and LIPS is used simultaneously in space exploration because similar optic equipment are utilized and two methods are complementary [(2)]. However, currently, Raman and LIPS are utilized independently in optical equipment and detecting systems in space exploration.

II. Result and Discussion

In this research, we equip the double pulsed Raman-LIPS system for taking molecular and atomic information simultaneously as shown in Fig 1. Furthermore, by plasma stacking the limit of detection(LOD) of LIPS signal was enhanced up to 2 times for space exploration.



[Fig.1] A schematic of double pulsed Raman-LIPS system

Acknowledgements

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References

[1] S.-J. Choi, J.-J. Choi, and J. J. Yoh, “Advancing the experimental design for simultaneous acquisition of laser induced plasma and Raman signals using a single pulse”, Spectrochimica Acta Part B, 123, 1-5, (2016)

[2] S.-J. Choi., K.-J. Lee., and J. J. Yoh, “The laser-induced plasma persistence time extension in low pressures using the ablated mass confinement method”, Spectrochimica Acta Part B, 97, 113-117, (2014)