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An Approach to The Development of Raman Spectroscopy System for Field Usage

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Raman spectroscopy is a spectroscopic technique that is used to analyze the chemical constituents or structure of molecules and can be applied to solid, liquid, and gas materials. This technique has been widely used in various fields such as analysis of medicine constituents in a pharmaceutical application, narcotic classification, examination of explosive substances for forensic medicine, and usage in quality control of semiconductor and microelectronics process industry. The Raman technique relies upon the inelastic scattering of photons, which is called Raman scattering. The Raman signal, which is either lower or higher energy than the incident photon due to inelastic scattering, is emitted when excited sample molecules at a virtual energy state transiting to the ground state in a short time.
Commercially, almost Raman spectrometers are constructed with many optical and electrical parts for fluorescence noise and background reduction and Raman signal enhancement. Consequently, almost commercial Raman spectrometer systems were neither compact nor carriable for field usage purposes. Therefore, in this study, we propose an approach to develop a compact Raman spectrometer that can be used in the field. Our system is only composed of necessary components such as a laser source, lens, and compact spectrometer. These components are designed to be set up in a compact area. Then, the raw Raman signal from a compact optical system with large noise and background signal is filtered by using a polynomial fitting-based Vancouver algorithm. The Vancouver algorithm is chosen because it is more accurate and faster than other methods in noise and background removal. According to the experiments, we found that our approach can give distinguish Raman peaks of the paracetamol sample, which is very close to the signal from the commercial system. Therefore, our designed system approach will be applied to make the Raman spectrometer for field usage in near future.

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