

Manufacture of Diffraction Grating Spectroscope and Development of Automatic Spectrum Analysis System

Park, Uicheol (School: Kyeongbuk Science High School)

Lee, Yunseo (School: Kyeongbuk Science High School)

Park, Sejong (School: Kyeongbuk Science High School)

Manufacture Of Diffraction Grating Spectroscope And Development Of Automatic Spectrum Analysis System Uicheol Park, Yunseo Lee, Sejong Park Kyeongbuk Science High School, Pohang, Gyeongsangbuk-do, Republic Of Korea Abstract
Astronomical spectroscopy requires a new kind of astronomical spectroscopic observation system. It is due to two reasons: firstly, that astronomical spectroscopes are expensive pieces of equipment, and secondly, that they do not allow us to perform spectroscopic observation and spectrum analysis at the same time. The purpose of this study was to develop an automatic spectroscopic observation system that is relatively inexpensive and can perform both spectroscopic observation and spectrum analysis of astronomical objects simultaneously. Using a CMOS camera, we manufactured a diffraction grating spectroscope for astronomical spectroscopic observation. The dispersion of spectrum of the spectroscope is 0.22823nm/pixel and the limit of wavelength of the spectroscope is from 910.56128nm to 209.43872nm. Also, we wrote an algorithm with a spectrum analysis program in Python. After that, we observed the emission spectrum of hydrogen (H), helium (He), argon (Ar), krypton (Kr), mercury (Hg), and carbon dioxide (CO₂). Based on the data, we analyzed the sun and the moon spectrum. The system was evaluated by drawing two-dimensional (2D) and three-dimensional (3D) spectrum profiles. As a result, hydrogen and helium were detected in the sun, and also in the moon. This implies that the moon reflects the sunlight. Through this study, we hope to contribute to astronomical spectroscopy by providing an invention that allows for fast and accurate spectroscopic observation.

Awards Won:

China Association for Science and Technology (CAST): Award of \$1,200