

Liquid crystal tunable filter technology for multispectral remote-sensing by micro-satellites

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New types of optical remote-sensing instruments for 50-kg class micro-satellites have been developed at Hokkaido University and installed on micro-satellites developed under international collaboration. For example, the High Precision Telescope (HPT) on the RISING-2 micro-satellite achieved a spatial resolution on the ground of approximately 5 m and represented the world's highest level of performance for small satellites in the 50-kg class. The HPT employs advanced technology including a liquid crystal tunable filter (LCTF) that was applied for the first time in the world to a space-borne multispectral sensor. The LCTF is a kind of optical band pass filter with the center wavelength electrically controlled at 1 nm intervals in the visible and near infrared regions. Compared to conventional multispectral sensors, the advanced sensor using the LCTF has the great advantage of enabling multispectral observations with hundreds of bands. The LCTF can also reduce size, weight, and power consumption of multispectral sensors and the advanced sensors using the LCTF are suitable for small and dynamically unstable satellites. This technology will change the utilization of micro-satellites that previously have not been applied to the multispectral and hyper spectral Earth observation, such as ocean color observation, tree species classification, and mineral resource exploration.