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Laser Spectroscopy Applied in Environmental, Ecological, Agricultural and Medical Research

Tuesday, 5 July 2022 14:00 (45 minutes)

Laser spectroscopy is a flourishing research area, which had major impact in science during recent years. In applied laser spectroscopy, the fields of combustion diagnostics, atmospheric remote sensing, agriculture and ecology, as well as biomedicine are prominent. An overview of certain applications of laser spectroscopy is given, with emphasis on the environmental, agricultural/ecological, and biomedical areas, as based on the experience of the author within these fields.

Optical probing of the atmosphere using active remote sensing techniques of the laser-radar type will be discussed. Atmospheric objects of quite varying sizes can be studied. Mercury is the only pollutant in atomic form in the atmosphere, while other pollutants are either molecular or in particle form. Light detection and ranging (Lidar) techniques provide three-dimensional mapping of such constituents. Recently, the techniques have been extended to the ecological field. Monitoring of flying insects and birds is of considerable interest, and several projects have been pursued in collaboration with biologists. Fluorescence lidar allows remote monitoring of vegetation and historical building facades. In agricultural applications, e.g., the fertilization levels of crops can be assessed. Drone-based techniques are now also augmenting the possibilities of fluorescence mapping of the environment.

Fluorescence spectroscopy has important applications in tissue characterization, using similar methods as for environmental monitoring, but now on a smaller scale. Tumours can be eradicated using photodynamic therapy. Free gases related to the human body are found, e.g., in the lungs, the middle ear, and the sinus cavities. The gas in scattering media absorption spectroscopy (GASMAS) technique has proved useful in the monitoring of lung function in neonatal children, and shows promising potential in the characterization of otitis and sinusitis.
The importance of cross-disciplinary work in solving important societal problems is emphasised.

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No

Level for award;(Hons, MSc, PhD, N/A)?

N,A

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Yes, I ACCEPT

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