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OPTOELECTRONIC SENSORY SYSTEM FOR SPECTROMICROSCOPES

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ABSTRACT

In order to obtain a high microscopic and spectral resolution, both for the microscopic study and for the spectrometric analysis carried out at the same time and at the same place on studied material, an adaptive optoelectronics for Raman spectromicroscopes with the wavelength of monochromatic excitation located at 1064 nm is designed and described. The current system and its working mode have a major disadvantage due to the fact that in the search for the focal point, which ensures the maximum spectral resolution, the studied material is moved several times to and from the focusing lens of the monochromatic laser excitation radiation. On this occasion the height of the peaks of the Stokes spectral lines is monitored and it is considered the focal point reached when the height of these peaks is maximum. Due to the high energy density in a focal point, repeated searches of this point, searches that lead to its repeated traverses, the chemical composition of the investigated material is modified and in some cases even the decomposition of some of its components.The paper presents an advanced technical solution that allows both the microscopic study of the material studied in the focal point of the visible spectrum and the rapid and automatic search and finding of the focal point in the Raman spectral analysis, at the wavelength of 1064 nm in the infrared spectral domain, without the material studied to be thermally affected.

Keywords

Raman spectromicroscope, automatic focal point search

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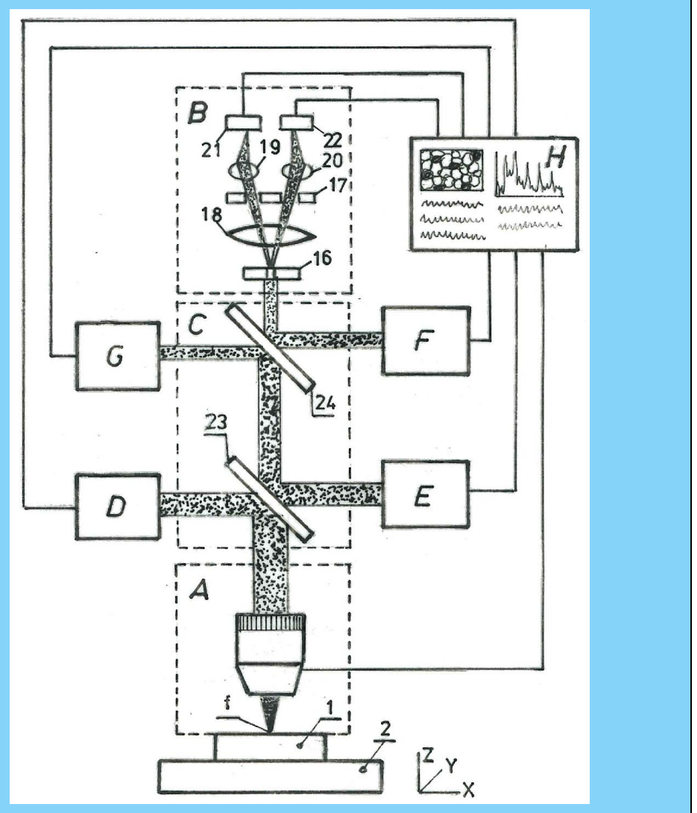
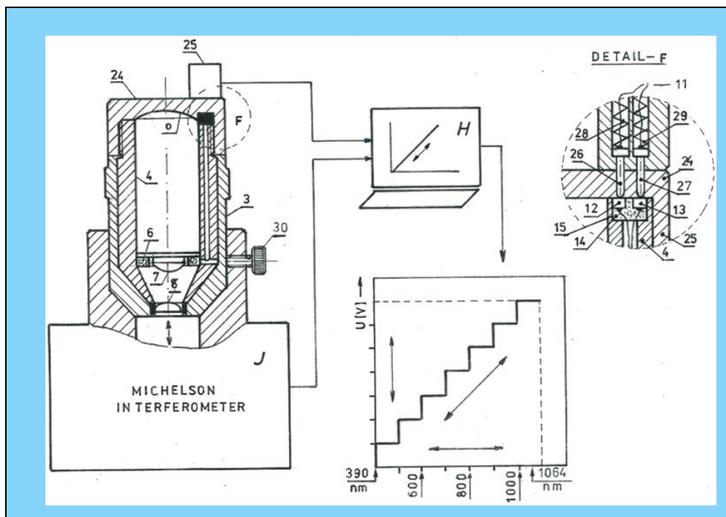
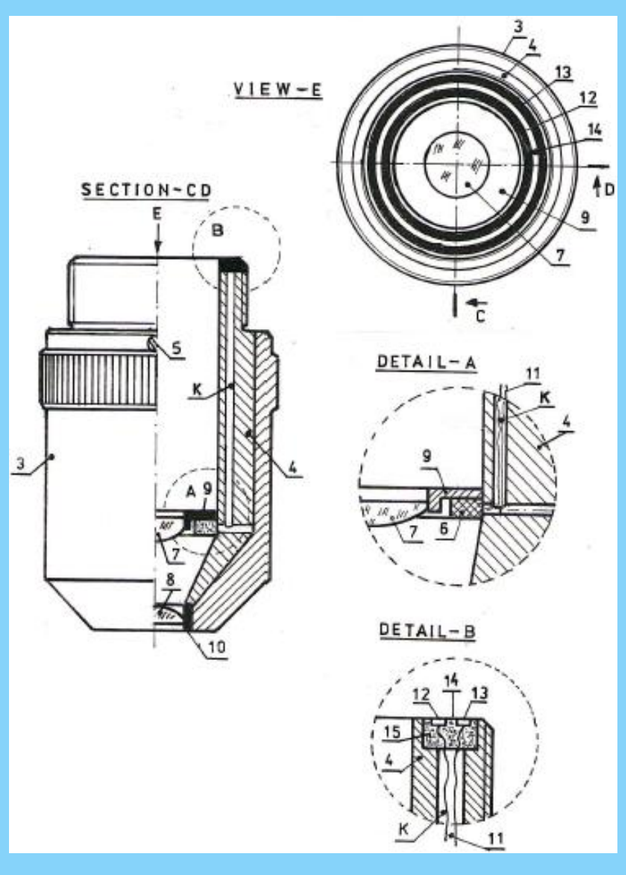


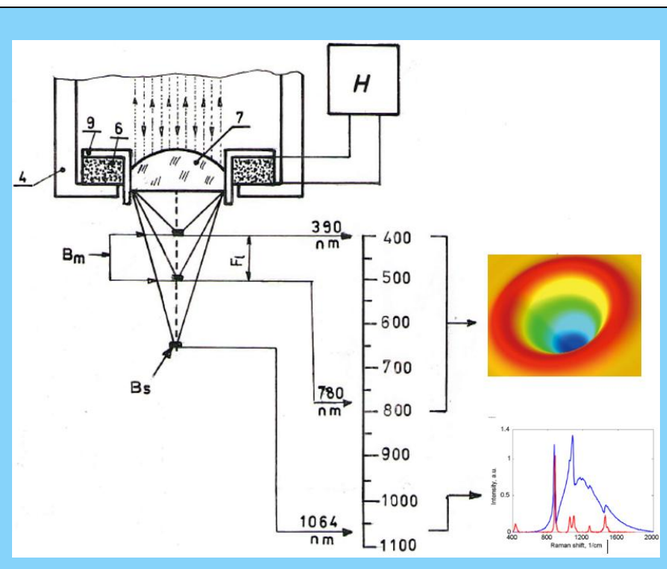
Schematic diagram of a Raman spectromicroscope with active optics.1- the analyzed material, 2- vertical displacement table, A- optical microscope objective, B- displacement control system, C- optical tube, D-source of polychromatic radiation, E-Laser monochrome radiation source, F- Raman spectrometer, G- optoelectronic system for the acquisition of optical microscopy images, H-electronic computer, I-specialized software, J- interferometric system, 16,17-slots, 18,19,20-lenses, 21,22- Diode-Array optical detectors



Calibration mode of focal point movements using a Michelson interferometer, J-Michelson interferometer, H-electronic computer, 3,4-metal bodies, 6-piezoelectric actuator, 7,8-focusing lenses, 9,10-metal fittings, c-channel, o-metal mirror, 12,13- copper rings, 14-epoxy resin, 15-circular housing, 23,24-semi-transparent mirrors, 25- Threaded cap with metal mirror-o, 26,27-cylindrical contact rods, 28.29-compression springs



View and section through an optical lens equipped with a piezoelectric actuator. 3,4-metal bodies, 5-drowned screw, 6-piezoelectric actuator, 7,8-focusing lenses, 9,10-metal fittings, c-channel 11-power cable, 12,13-copper rings, 14-epoxy resin, 15-circular seat



Schematic diagram for finding the focal point of polychromatic radiation and monochrome laser radiation with a wavelength of 1064 nm. 4-metal body, 6-piezoelectric actuator, 7-focusing lens, 9-metal armature, H-electronic computer, m-microscopic image, s-Raman spectrogram

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