Methodology for studying the properties of gas discharge plasma in mixtures of inert gases with chalcogen atoms vapours

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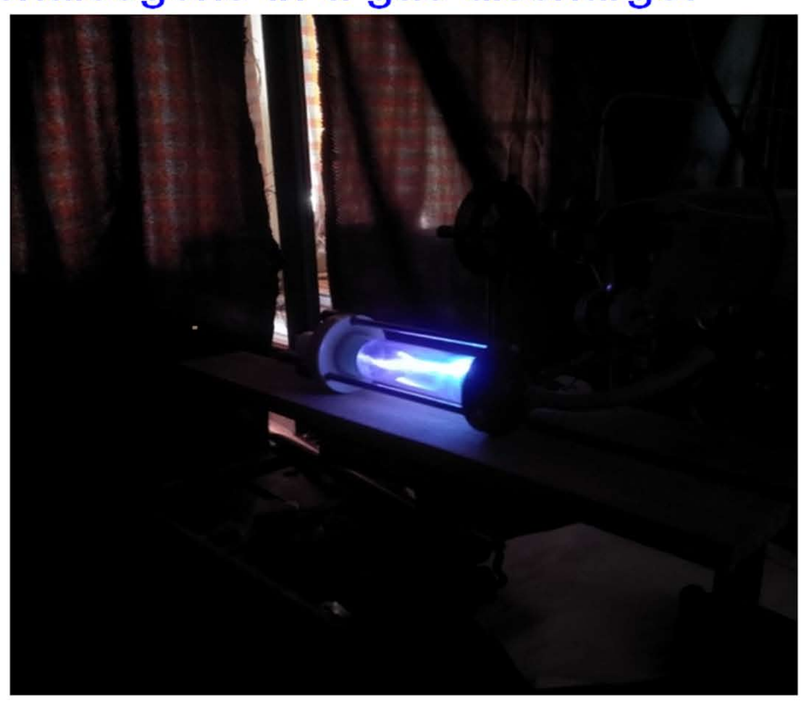
Due to its multifaceted properties, sulfur is included in the composition some amino acids (cysteine, methionine), vitamins (biotin, thiamin) and enzymes, and redox reactions of sulfur are a source of energy in chemosynthesis. It is important to emphasize that sulfur is contained in the atmosphere of some spaceships objects and is a very common element in the universe and interstellar space environment. This determines the constant interest in the study of various physical and chemical properties of sulfur.

Relevance of research

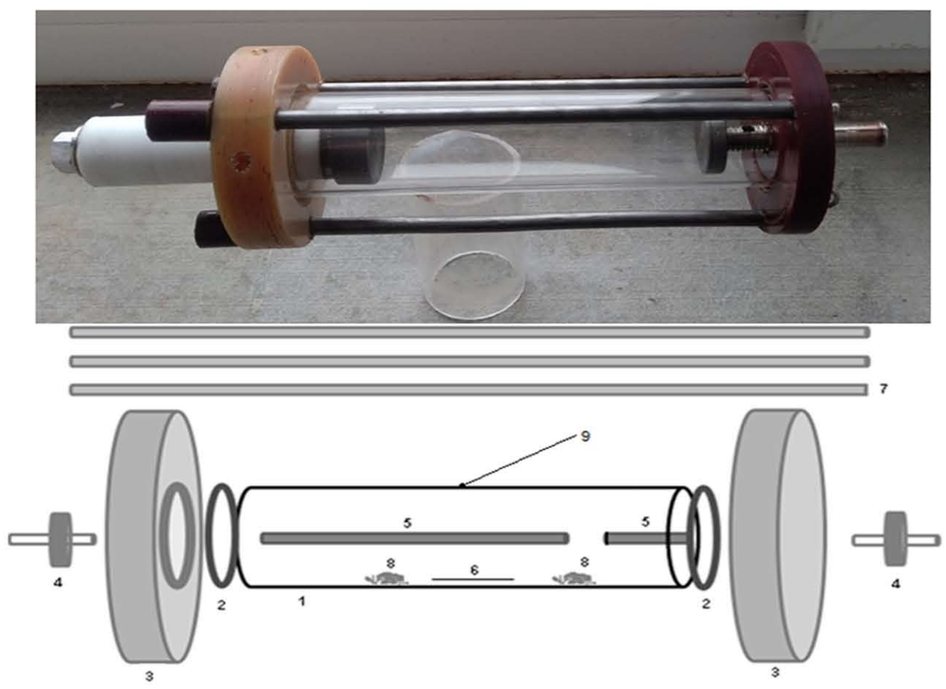
Discharges in mixtures of noble gases with sulfur vapors are promising light sources for obtaining a radiation spectrum similar to that of the sun. It is possible to create efficient light sources with a high-quality spectrum, which, moreover, do not require special processing measures. Sulfur lamps are much more environmentally friendly than mercury, halogen or fluorescent lamps, because they do not contain mercury, lead, etc. sh. supplements That is, they can be put on the same ecological level as LEDs.

Advantages of sulfur microwave lamps:
environmental friendliness, high quality of the radiation spectrum and high energy-efficient properties.

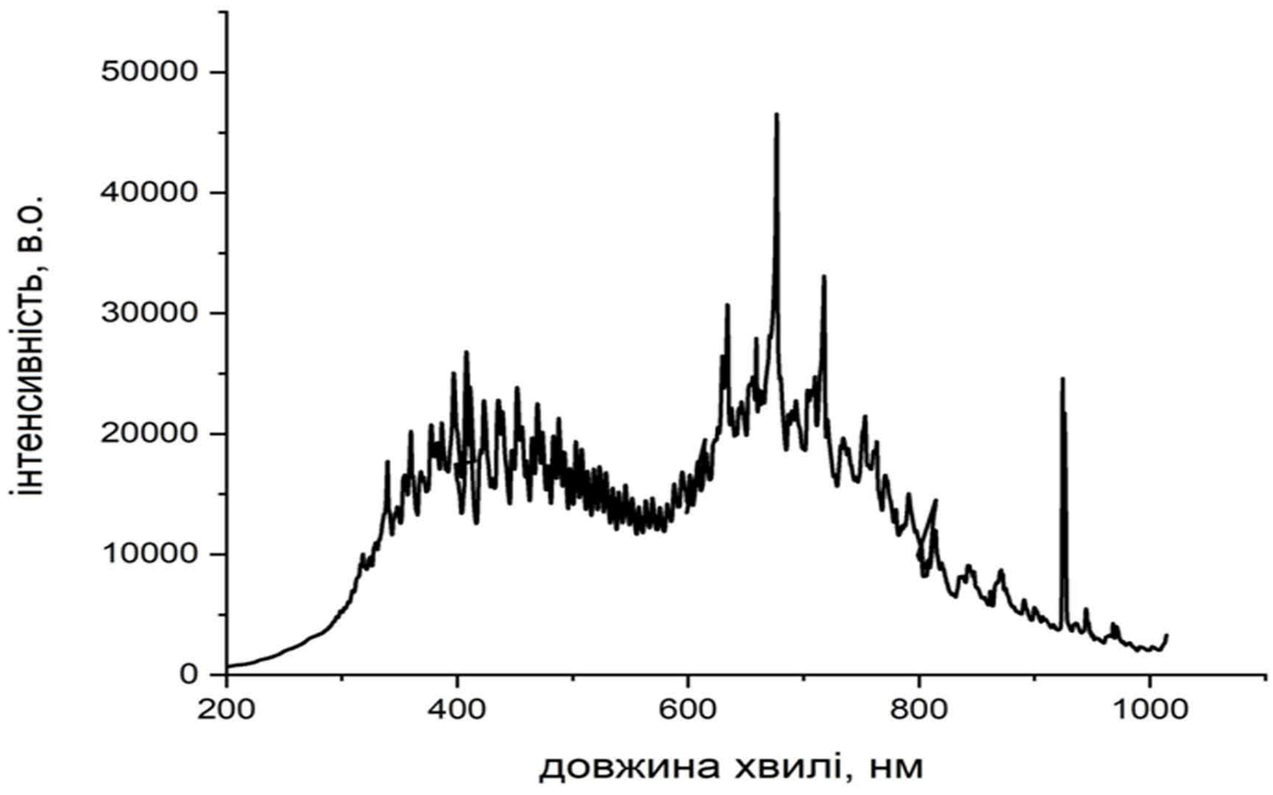
Working laboratory GDT for the study of the emission properties of chalcogens in a gas discharge.



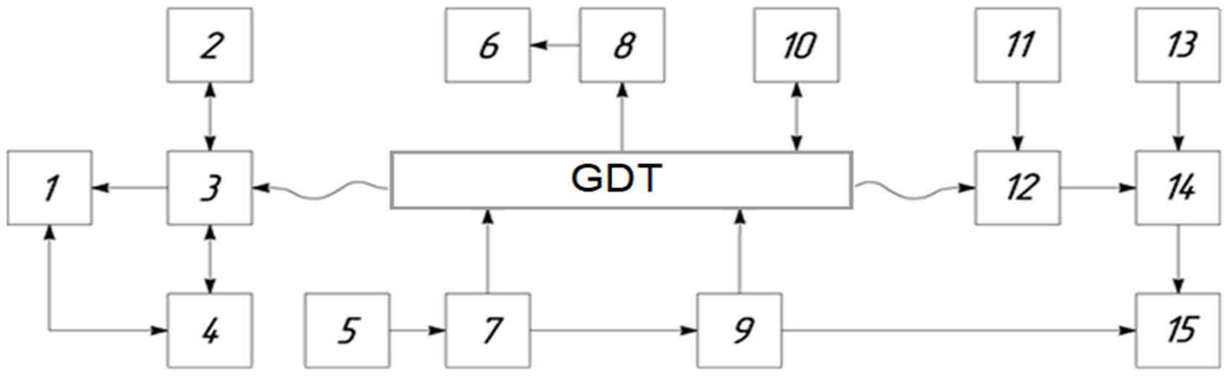
General view of a universal discharge camera.



1 – quartz tube, 2 – vacuum gasket, 3 – dielectric flanges, 4 – universal h voltage inputs, 5 – metal electrodes, 6 – sputtering glass, 7 – fixing pins, 8 sulfur, 9 – thermocouple.



Block diagram of the experimental setup



1 – HS 101H CCD camera; 2 – photoelectronic multiplier R928; 3 – MS 7504i spectral monochromator; 4 – computer; 5 – pulse voltage generator G5-54; 6 - milliammeter; 7 – high-voltage pulsed power supply unit; 8 – thermocouple; 9 – current shunt; 10- pumping and gas release system; 11 – monochromator stepping motor control unit; 12 – spectral monochromator MDR-6; 13- power supply unit FEP BR-1; 14 – photoelectronic multiplier FEU-106; 15-universal oscilloscope C1-99.

The time-integrated spectrum of sulfur radiation (i = 0.08 A, u = 6 kV, f = 5 kHz, p = 10^5 Па)

Conclusions

The results of the first measurements of the spectral characteristics of the emission of a mixture of sulfur vapor with helium in a gaseous pulse-periodic discharge in the ultraviolet and visible spectral regions are presented.

The obtained experimental data made it possible to create a source of low-temperature plasma based on sulfur vapors (an application for a useful model is being prepared), which can find practical application in physical electronics, medicine, and light engineering.