

BOOK REVIEW

Methods and Instruments for Visual and Optical Diagnostics of Objects and Fast Processes

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The book reveals the development of new technologies related to the object exposure to energy fluxes in active optical systems. This involves the surface modification for improving performance characteristics, producing new materials and nanostructures, welding and cutting processes, using high-temperature synthesis (SHS), etc. First of all, this happened because the impact of energy fluxes is always accompanied by the powerful background lighting which impedes the object visualization and control of technological processes. The use of laser active media on self-terminating transitions in metal vapors, used as brightness amplifiers, allows to view such objects due to the high spectral brightness and a high gain within a narrow spectral band. The pulsed-periodic radiation character makes it possible to monitor objects with a high time resolution which corresponds to the pulse repetition rate. The typical pulse repetition rate in metal vapor lasers is 5-15 kHz. Using high speed metal vapor brightness amplifier and modern digital cameras Prof. Evtushenko and his colleagues have developed laser monitor for visual and optical monitoring objects and high speed processes in real-time mode, with time resolution 10^{-5} sec. In particular, application of laser monitor for high speed imaging allowed to study the dynamic of interaction between powerful laser radiation with oxide targets and SHS-processes.

The authors also study the high-voltage nanosecond discharges initiated by runaway electrons and determination of the plasma parameters of such discharges by spectral techniques. The description of experimental setup and methods used in experiment and main obtained results are presented. The electron density of gas discharge plasma was measured by the technique based on the Stark broadening of spectral lines. The radiation-collisional plasma model was used to measure an electron temperature and reduced electric field strength. The radiation on the vibrational-rotational bands of second positive system of nitrogen was used to measure a gas, rotational and vibrational temperatures of plasma. The results of study of colored jets that arise due to the explosion of microinhomogeneities are given as well.

I highly recommend this book to physicists, engineers, PhD students and all interested scientists.

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