OPTICAL DIAGNOSTICS OF DISCHARGES BURNING IN Na[1)]

BRABLEC, A.,[2)] GROLIG, M.,[2)] ZU-HAM-SUN,[2)] KAPIČKA, V.,[2)] KOVÁŘ, L.,[2)], Brno

A discharge burning in Na (at the pressure $\sim 1.3 \times 10^2$ Pa) is a source of spectral lines of Na with self-absorption. These spectral lines were used for establishing the temperature of neutral particles [1—3]. The holographic method was used for the radial course of temperature [4].

I. INTRODUCTION

The arragnement cansists of the Fabry-Perot interferometer fy Burleight situated in the device of fy Zeiss fitted up by another device taking off the lines withis 20 ms and the Mach-Zehnder interferometer (with the Ne-He laser type LA 1001 the power output 0.06 W, the wavelength of the spectral line is 632.8 nm). The interferometer was used for the holographic measurement of temperature.

For the given computer (SORD) a program is compiled and tuned to enable the calculation of the refractive index change from the radial distribution. It is possible to obtain radial distribution of temperatures in the discharge burning in Na by means of photographs taken at several time intervals.

II. EXPERIMENTAL RESULTS

Results of line profiles measurements with selfabsorption — Na 588.9 nm and 589.6 nm — show that the Stark and resonance broadening (~ 0.001 nm) and the dispersion broadening (~ 0.0005 nm) are negligible, because the spectral lines broadening is influenced by the apparatus function (width is ~ 0.003 nm) and by the Doppler-effect (0.0105—0.0151 nm).

[1)] Contribution presented at the 7th Symposium on Elementary Processes and Chemical Reactions in Low Temperature Plasma, STARÁ TURÁ-DUBNÍK, June 13–17, 1988

[2)] Department of Physical Electronics Faculty of Science Purkyně University Brno, Kotlářská 2, BRNO, Czechoslovakia

The interferometric determination of neutral particles temperature in Na discharge plasma from the Doppler broadening of the spectral lines requires the deconvolution of the recorder line profiles from the apparatus profile of the spectrometer used in this measurement [5—7]. The deconvolution of the line profile distorted by selfabsorption requires the knowledge of the optical thickness of the spectral line (in our case 0.81) and parameters of the apparatus profile — measured in our case.

The temperature of neutral particles temperature was 850 K.

The holographic method allows to determine the radial course of temperature (fig. 1), which was measured in other discharge than the neutral particles temperature.

The temperature 2830 K was obtained from the intensity of spectral lines of Na [8—10].

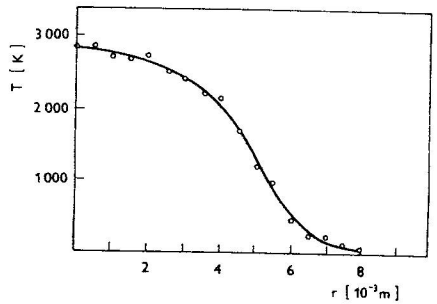

Fig. 1.

III. CONCLUSION

The computers and modern methods discussed above may serve to determine the time courses of physical parameters (e.g. the temperature, the concentration of charged particles) in burning discharges used in technical applications.

The methods based on the measurements of spectral lines width may be used even for non-equilibrium plasma and plasma with selfabsorption.

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Received July 13th, 1988
Accepted for publication August 26th, 1988

ОПТИЧЕСКАЯ ДИАГНОСТИКА РАЗРЯДОВОГО ГОРЕНИЯ В Na

Разрядовое горение в Na (при давлении $\sim 1{,}3 \cdot 10^2$ Pa) является источником спектральных линий Na с самопоглощением. Эти спектральные линии были использованы для определения температуры нейтральных частиц [1—3]. Для радиального хода температуры был использован голографический метод [4].