FTD-ID(RS)T-1067-88

FOREIGN TECHNOLOGY DIVISION

LASER PHOTOELECTRIC EFFECT AT SURFACE OF DISCHARGE CATHODE

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HUMAN TRANSLATION

FTD-ID(RS)T-1067-88 24 January 1989

MICROFICHE NR: FTD-89-C-000054

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English pages: 2

Source: Zhongguo Jiguang, Vol. 13, Nr. 9, 1986, pp. 590

Country of origin: China
Translated by: Leo Kanner Associates
F33657-88-D-2188
Requester: ASD/FTD/TQIA

A-1

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The photoelectric effect is produced by a glow discharge cathode irradiated by a continuous CO laser; this photoelectric effect is not related to the frequency of incident light (that is nonresonant absorption photoelectric current) but is only proportional to the intensity of incident light. Moreover, the photocurrent produced by a unit of light intensity is very sensitive to discharge current, gas composition, and gas pressure. A high temperature photoelectron emission mechanism at the cathode surface is described.

(1) In a gas discharge, the positive ions bombard the cathode surface causing an instantaneous temperature rise at the surface microzone up to the melting and vaporization point temperatures; large numbers of high dynamic energy electrons exist in the microzone.

(2) Some high energy electrons absorb incident photons and escape outside of the metal surface, thus causing photoelectron emission.

(3) Due to the multiflow effect of the gas, photons at cathode surface are amplified into the photocurrent.

The theory can be better illustrated by the experimental results.

Using a direct heating type filament vacuum diode irradiated by a CO laser, the authors also detected a photocurrent. This finding further proves the occurrence of red shift effect of photoelectric emission frequency with rise in metal surface temperature.

It is pointed out that the photoelectric emission of discharge cathode can be possibly utilized as a type of photoelectric receiver. (207)

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