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## THE GALLIUM ARSENIDE (Cs-O) HETEROJUNCTION BARRIER

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**Abstract.** — The negative electron affinity photocathodes, in particular GaAs, have been extensively studied in recent years [1]. Negative electron affinity occurs when a low work function coating, for example caesium plus oxygen, reduces the vacuum level below the bottom of the conduction band. Electrons are excited in the bulk of the crystal, and, having rapidly thermalised diffuse to the vacuum interface where a certain fraction are emitted. The efficiency of this final process depends on various parameters such as the nature of the surface, the (Cs-O) activation procedure used, and the electronic properties of the surface, for example the degree of band-bending.

An equally important parameter which is particularly evident in the case of photoemission from ternaries is the heterojunction barrier [2] between the semiconductor and the Cs-O coating. Experiments have been conducted to measure this parameter on n and p type GaAs.

Using heat cleaned (100) Si doped GaAs, the photoelectric thresholds were determined as the thickness of the (Cs-O) coating increased. Values for the heterojunction barrier in the range 1.26-1.32 eV were measured. In the case of p type GaAs, because of the nature of the band bending at the surface, it is not possible to measure the thresholds directly. However some work has been carried out on heat cleaned (100) Zn doped p type GaAs and, taking energy distribution measurements as the thickness of the Cs-O coating is increased, the heterojunction barrier has been found to be  $\sim 1.3$  eV.

There is thus some evidence from these measurements, that the barrier height is the same for both n and p type GaAs. It is difficult to assess the importance of the barrier, but in the case of p type material it appears that the maximum sensitivity occurs when the work function is equal to the barrier height.

### Bibliographie

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