Surface Barriers in ZnSe and ZnO*

C.A. Mead

We report measurements of surface barrier heights of several metals on vacuum cleaved ZnSe and ZnO surfaces, indicating that both of these materials behave as expected for materials without surface states. Samples were prepared by cleavage in a vacuum in the stream of evaporating metal, thus insuring a clean interface. Barrier heights were measured using the photoresponse technique on the ZnSe and for the higher barriers on the ZnO, and by analysis of the *I-V* characteristic for the lower barriers on ZnO (Cu, In, Al, Ti). The detailed procedure has been described previously [1]. The results of this study are shown in Fig. 1, together with the values for ZnS taken from Aven and Mead [2]. The probable errors are greater for the lower barriers, in some cases it being only possible to give an upper limit (as indicated by the bars). For the higher barriers the probable error is less than 0.1 eV.

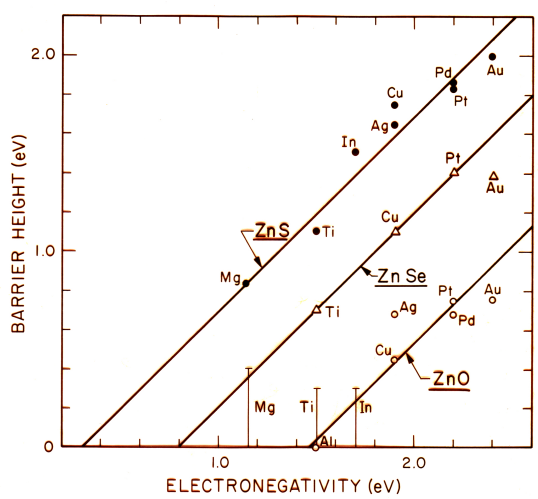

Figure 1: Barrier heights of various metals on ZnO, ZnSe and ZnS.

It can be seen that these values exhibit, within experimental error, the unity slope linear relationship between barrier height and electro-negativity as found for ZnS and CdS. This behavior can be interpreted in terms of an interface with no surface states in the forbidden gap; a characteristic of ionic-like semiconductor [3]. The intercepts correspond to a measure [2] of the electron affinity of the semiconductor. It is difficult to make quantitative statements about this value, but it may be expected that the high value for ZnO is closely related to the high ionization potential and electronegativity of the oxygen.

The author wishes to thank H.M. Simpson for preparing the samples, and W. Holden for supplying the ZnSe crystals. The work was supported in part by the Office of Naval Research and the International Telephone and Telegraph Company.

*Re-typeset from original material by Donna Fox, July, 2019. Originally published in *Physics Letters,* Vol. 18, No. 3, p. 218, September, 1965

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