

Electronic property of photosensitive film on copper in solutions of potassium iodide

JUDAS FRANCO AND N. K. PATEL

Chemistry Department, Bhavan's R.A. College of Science, Khanpur, Ahmedabad-1, India

Received 12 June 1973

Trivedi *et al.* [1] obtained a photosensitive film on brass by immersing the metal in 0.001 M tartaric acid but they did not investigate it in detail. Effects of illumination on the potential of copper electrodes in chloride-containing solutions have been observed by Pourbaix *et al.* [2] and by Lucey [3]. This report is essentially an extension of the work published by ourselves in this *Journal* [4] in which the formation of photosensitive films on copper immersed in bromine solutions was reported.

Copper plates (99.9% Cu) were washed, dried, polished [4] and degreased by immersion in sulphur-free carbon tetrachloride. The plates were dipped in 0.1 M potassium iodide for about 24 h and the two surfaces connected to a ballistic galvanometer. One surface was exposed to sunlight and the other was unilluminated. The apparatus was as used previously [4].

The formation of CuI film after 24 h immersion was confirmed by chemical tests. This material is photosensitive giving an image of the markings on the container, as reported previously for bromine [4], when exposed to sunlight. By using filters, it was observed that image formation occurs over the whole range of the visible spectrum, being at a maximum in the region 300 to 450 nm. The photo-current was again found to change and reverse direction with time (Fig. 1). The time needed for image formation seems to correlate with the change in current during exposure. The change A to B may correspond to photosolvation and the reversal is probably due to decomposition of the solvated complex in the presence of adsorbed oxygen and sunlight to form Cu₂O [5]. The current levels in the region

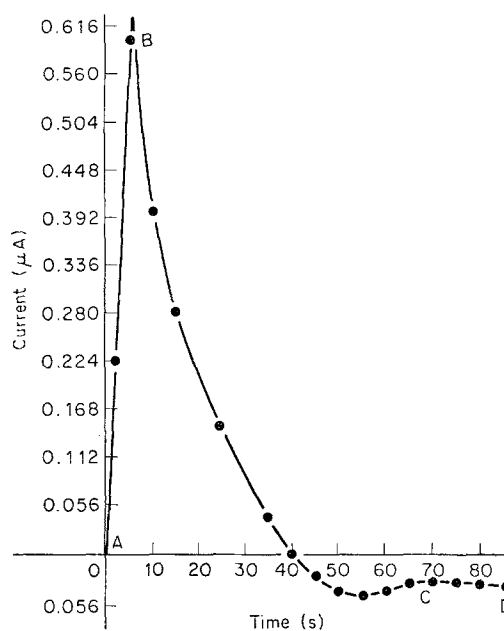


Fig. 1

CD may be due to an n-p semi-conductor junction formed from CuI (n-type) and Cu₂O (p-type). The current reversal is due to a change in film composition in the presence of sunlight.

References

- [1] A. M. Trivedi and M. N. Desai, *Current Sci.*, **25** (1956) 354.
- [2] M. Pourbaix, J. Van Muylder and P. Van Laer, *Corros. Sci.*, **7** (1967) 795.
- [3] V. F. Lucey, *Br. Corros. J.*, **2** (1967) 175.
- [4] J. Franco and N. K. Patel, *J. Appl. Electrochem.*, **3**, (1973) 303.
- [5] J. F. Danielli, K. G. A. Pankhurst and A. C. Riddiford, 'Recent progress in surface science', Vol. 1, p. 236, Academic Press (1964).