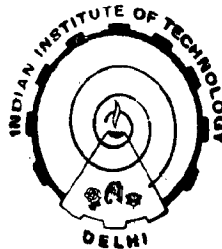


**STUDIES ON XEROGRAPHIC CHARACTERISTICS  
OF SOME MIXED AND MULTI-LAYERED  
PHOTO-RECEPTOR SYSTEMS**

By  
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Thesis submitted in fulfilment of the  
requirements of the degree of  
**DOCTOR OF PHILOSOPHY**



To The  
**INDIAN INSTITUTE OF TECHNOLOGY, DELHI**  
INDIA

**FEBRUARY, 1987**

TO MY PARENTS

CERTIFICATE

I am satisfied that the thesis entitled 'Studies on Xerographic Characteristics of Some Mixed and Multilayered Photo Receptor Systems' submitted by Pramod K. Sharma is worthy of consideration for the award of the degree of DOCTOR OF PHILOSOPHY and is a record of the original bonafide research work carried out by him under my guidance and supervision and that the results contained in it have not been submitted in part or full to any other University or Institute for award of any degree/diploma.

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## ABSTRACT

The main emphasis of the present work has been on the evaluation of electrophotographic properties of various pigment resin systems. These properties of ZnCdS:Ag Single layer, ZnCdS:Ag/Cd(S,Se):Cu and Michler's Ketone/Cd(S,Se):Cu mixed layers and ZnCdS:Ag/Poly-vinyl carbazole (PVK) double layer system have been investigated. Different binder resins used were, Polystyrene (PS), Polyacrylonitrile-butadiene styrene (ABS) and Ethyl Cellulose (EC) to identify the best binder for a specific photo conducting system.

Photoconductivity study gives an idea of the distribution of trapping levels in the photoconductor. A study of photoconducting properties of ZnCdS:Ag/Cd(S,Se):Cu mixed system was carried out in order to have a better understanding of charge transport phenomenon in the bulk of the material. Dark current and photo induced current dependence upon the field across the sample, for different compositions of two compounds were studied. The 20:80 ratio of ZnCdS:Ag/Cd(S,Se):Cu shows an enhanced  $I_P/I_D$  value ( $= 3 \times 10^6$ ). Activation energies were calculated from dark and photocurrent dependence on temperature.

The observed electrophotographic results showed that mixed and double layer systems have enhanced electrophotographic characteristics over the single layer systems.

Electrophotographic studies consisted of dark and photo-induced discharge characteristics, contrast potential, spectral sensitivity and absorption spectra for different systems. Layers made with Polystyrene binder showed better results among all the binders used.

A study of persistent internal polarization gives the nature of trapping states present in the photo conductor. Photoelectret studies on ZnCdS:Ag/Cd(S,Se):Cu mixed system were carried out to assess its suitability for PIP electrophotography. The 20:80 ratio of ZnCdS:Ag/Cd(S,Se):Cu was observed to show good photo-electret charge, however this system is unsuitable for PIP electrophotography as its charge retention properties were poor, indicating an absence of deep traps in the composite materials.

A part of the above mentioned studies have resulted in the following research publications:

1. Instrument for Electro-optical Measurements of Photoconductors. Proc. Natl. Conf. on Instr. April 1983, CSIO, Chandigarh, India, p. 278.
2. Study of the opto-electronic properties of ZnCdS:Ag/Cd(S,Se):Cu mixed system for electrophotography. Presented at Symp. on Optics, NPL, New Delhi, India, Feb. 1985.
3. Michler's Ketone/Cd(S,Se):Cu mixed photoconductor system for Electrophotography. Surface and Coatings Technology, 28 (1986) 25-32,

4. ZnCdS:Ag/Cd(S,Se):Cu mixed photoconductor system for Electrophotography. *Journal of Material Science*, 21 (1986) 3259-3262.
5. Electrophotographic Characteristics of ZnCdS:Ag/Poly-Vinyl Carbazole (PVK) double layer system. *Journal of Material Science Letters*, 5 (1986) 857-858.
6. Photoconductivity and dark conductivity of ZnCdS:Ag/Cd(S,Se):Cu mixed system. *Journal of Electrostatics*, (In Press).
7. On the photoconductivity of ZnCdS:Ag/Cd(S,Se):Cu mixed system. *Journal of Electrostatics*, (Accepted).

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