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Optical and electrical characteristics of triphenylamine composites

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Optical, electrical and electrophotographic characteristics of an electrophotographic composite based on triphenylamine, polycarbonate and sensitizer are described. The current-voltage and lux-ampere characteristics of thin composite layer are considered. Introduction of a photoconductor in polymer binder does not result in appearance of deep discrete trapping levels of current carriers. In composite electrophotographic layers, high electrical resistance, good charge transport properties, mechanical characteristics, adhesion to substrate of a polymeric matrix may be combined successfully with high photogeneration ability of the monomolecular photoconductor.

Описаны результаты исследования оптических, электрических и электрофотографических характеристик композиционного электрофотографического материала на основе трифениламина, поликарбоната и сенсибилизатора. Проанализированы вольтамперная и люксамперная характеристики тонкого слоя композиции. Введение фотопроводника в полимерное связующее не приводит к появлению глубоких дискретных уровней захвата носителей тока. В композиционных электрофотографических слоях могут удачно сочетаться высокое электрическое сопротивление, хорошие зарядно-транспортные свойства, механические характеристики, адгезия к подложке полимерной матрицы с высокой фотогенерационной способностью мономолекулярного фотопроводника.

The analysis of primary photophysical processes and excited state deactivation paths in macromolecules such as polyvinylcarbazole has shown that the migration of excitons in macromolecules of homopolymers results in significant losses of excitation energy [1]. Only two processes (exciton trapping by excimer- and exciplex-forming sites), and perhaps also triplet-triplet annihilation result in charge carrier photogeneration, while others, in loss of excitation energy. Therefore, to exclude the exciton diffusion and increase the photogeneration ability, it is expedient to make electrophotographic and photoplastic materials not of homopolymers, but of compositions including a monomolecular photoconductor, sensitizer and polymer binder. This concept has been realized in majority of various synthetic developments [2]. But as to composites, there is a question: are the monomolecular substances in a polymer matrix not only centers of charge carrier photogeneration but also simultaneously centers of their trapping? How wide are the operational parameter ranges of compositions?

To study these problems, we have chosen a typical composition of electrophotographic (EPH) material — solid solution of a photoconductor (triphenylamine) and sensitizing pyrilium dye in polycarbonate (PC). The commercial triphenylamine (TPA) was recrystallized twice from ether and chromatographed on aluminium oxide. $T_m = 126°C$. Polycarbonate (PC-6) was reprecipitated from ethylene dichloride to acetone. The sensitizer PF-103 (substituted 6-methoxystyrylpyrilium tetrafluoroborate) was synthesized by Igor Boyko Laboratory of Pereslavl branch of "Chimfotoproekt" Research Institute. The