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EFFECT OF ELECTRON BEAM ON POLY[METHYL(PHENYL)SILYLENE]

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The study of the properties of poly[methyl(phenyl)silylene] (PMPSi) was based on the measurement of intensity of the cathodoluminescent (CL) emission after passing through the specimen. The study of the PMPSi properties using the CL method is complicated by the material degradation characterized by the fall of the CL intensity. Therefore, the measurement in the synchronous mode was used to eliminate the influence of the background and of the noise.

At the excitation energy of 10 keV the irradiation time dependence of the PMPSi CL intensity was measured for the different electron beam current densities. For the highest current density, both the strongest intensity and the fastest fall have been observed. The speed of degradation depends on the irradiation time as well as on the current density of the excitation beam. The effect mentioned impedes the utilization of PMPSi as a detecting or signaling element. On the other hand, the degradation of PMPSi could be utilized in electron lithography.

The recovery of CL intensity in absence of oxygen proved the formation of the metastable states in PMPSi. The process of the recovery is the strongest at the smallest current density and decreases with increasing density. CL investigation of PMPSi proved creating of metastable states in the material. The degradation is a reversible process in this case. The understanding of physical and chemical mechanism of the degradation and of the reversible process of the PMPSi CL emission is interesting from both scientific and application points of view. This knowledge can lead to material stabilization. The recovery process, if fully reversible (the degradation level is less than about 40%), could be applicable to optical memory media or to molecular switches.