Abstract：The charging phenomenon in the insulating dielectrics often occurs in the radiative environments such as in the outer space and in the nuclear reactor. Both surface charging and bulk charging have various influences on the dielectric properties. Understanding electrical properties of e-beam irradiated dielectrics is of great significance in order to maintain the stability and reliability of the related operating system. In this work, the effect of electron beam irradiation on the permittivity of polymethyl methacrylate (PMMA) samples was investigated. It was found that the variance of permittivity in e-beam irradiated PMMA is mainly determined by two factors. One is the porosity of the material. The irradiating process could increase the porosity of PMMA due to the escape of the small molecule (e.g., CO, CO_2, and CH_4) produced during material degradation caused by e-beam irradiation. The enhanced higher porosity corresponds to lower permittivity. The distribution of the implanted charge is the other factor that influences the permittivity. When the distribution of electric field generated by the accumulating charge is asymmetric for the middle thickness of the sample, the PMMA sample with polar groups would be subjected to extra polarization by the field, which could lead to the increase in permittivity. Combining with the model of Wakino et al. [J. Am. Ceram. Soc. 76, 2588 (1993)] on permittivity of mixture materials, the Clausius-Mosotti equation was utilized to analyze the variation in permittivity in the e-beam irradiated PMMA samples.