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Secondary electron emission yield of Fluorinated Crosslinked Polystyrene

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With the development of high power microwave (HPM) technology and its transmitted power increasing from the level of MW to GW, dielectric window, as an important part of transmission and radiation system, is suffered with high gradient electric field, resulting in phenomena of surface flashover. Secondary electron emission yield (SEEY) is an important parameter determining build up of multipactor and final flashover. This paper is focused on SEEY measuement of fluorinated crosslinked polystyrene, a potential window material, to investigate influences of fluorination on multipactor suppression. An instrument for dielectrics SEEY with incident energy range from 50eV to 2000eV is established based on the classical electron-collector method. The hemispherical collector with two grids is used to collect secondary electrons, biased to +100V positive voltage. Experimental results indicate that fluorination can produce fluoride groups on the surface, C-Fn, after replacement reaction of C-H bonds. New introduction of C-F bonds change chemical energy structure and potential barrier of materials surface, resulting in decreasing of SEEY. Additionally, the treatment methods of fluorination involving fluorinated gas proportion and applied time have significant influences on SEEY. The decrease of SEEY can suppress multipactor formation and thus finally lead to increase of flashover threshold. Thses results are effective to illuminate theoretical mechnism of fluorination suppression and optimize the treatment process.

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