

**Abstract:** In this work, to improve the electret properties of cellular polypropylene films, they were fluorinated and post-treated with nitrous oxide and by isothermal crystallization. Surface electret properties of the samples were investigated by thermally stimulated discharge current measurements, and their compositions and structures were analysed by attenuated total reflection infrared spectroscopy and wide angle x-ray diffraction, respectively. Time-dependent deterioration of surface electret properties was observed for the fluorinated samples without the nitrous oxide post-treatment. However, deterioration did not occur for the fluorinated samples post-treated with nitrous oxide, and time-invariant excellent surface electret properties or deep surface charge traps were obtained by the combined post-treatments of the fluorinated samples with nitrous oxide and by isothermal crystallization. Based on the analyses of composition and structure of the treated samples, the deterioration was clarified to be due to a trace of oxygen in the reactive mixture, which led to the formation of peroxy  $RO_2$  radicals in the fluorinated surface layer. The time invariability of surface electret properties was owing to the rapid termination of the peroxy  $RO_2$  radicals by nitrous oxide. And the deep surface charge traps resulted from the isothermal crystallization treatment which led to an increase in the efficient charging interface between the crystallite and amorphous region and its property change.