Time-dependent change in charge trap of fluorinated cellular polypropylene (PP) films exposed to air is found by thermally stimulated discharge current measurements. It is clarified that the change is due to a trace of oxygen in the reactive gas mixture, which leads to the formations of peroxo RO\textsubscript{2} radicals as well as C=O-containing groups in fluorination as indicated by attenuated total reflection infrared analyses. However, time-invariant charge traps of fluorinated PP films can be formed by the post-treatment of fluorinated PP films with nitrous oxide which can effectively terminate the peroxo RO\textsubscript{2} radicals. And the combined post-treatments of the fluorinated films with nitrous oxide and by isothermal crystallization generate the time-invariant deep charge traps.