Abstract: Cellular polypropylene (PP) films were treated with sulfur hexafluoride (SF6) gas in order to study the SF6 penetration behaviour and optimize the electric charging conditions. There were differences in the penetration of SF6 for different cellular PP materials, depending on the microscopic properties, which manifest themselves in the voided structure as well as in the mechanical stiffnesses of the cellular films. The penetration of SF6 after long-term pressure treatment is confirmed in strongly inflated cellular PP films with a low mechanical stiffness of about 1 MPa. No SF6 penetration occurs for slightly inflated cellular PP films with smaller void sizes and higher mechanical stiffnesses of around 5.8 MPa. The observed thickness variations, the higher charging fields during corona charging because of SF6 penetration and the SF6 environment, as well as the resulting electromechanical properties are discussed.