A STUDY ON CF_3I-Ar AND CF_3I-Kr MIXTURE GASES SUBSTITUTING SF_6 IN HIGH VOLTAGE EQUIPMENTS

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Abstract:

The present binary mixtures of the SF_6 gas with Ar and Kr gases have not been used in many industries as long-term measures for totally eliminating the potential contribution of SF_6 to global warming. In order to gain more insight into electron transport coefficients in mixture gases as substitutes for SF_6 in high voltage equipment, transport coefficients such as electron drift velocity, density-normalized longitudinal diffusion coefficient, ratio of the longitudinal diffusion coefficient to the electron mobility, Townsend first ionization coefficient, electron attachment coefficient, and density-normalized effective ionization coefficient in CF_3I-Ar and CF_3I-Kr mixture gases are calculated and analyzed in the wide E/N range of 0.01 – 1000 Td using a two-term approximation of the Boltzmann equation for the energy. These calculated coefficients are analyzed and compared to those in pure SF_6 gas. The limiting field strength values of E/N, $(E/N)_{lim}$, of these mixture gases are also derived and compared with those of the pure SF_6 gas at different percentages of CF_3I and SF_6. The mixture gases of 70% CF_3I with Ar and Kr have $(E/N)_{lim}$ values greater than those of the pure SF_6 gas. Therefore, these mixture gases could be considered to substitute SF_6 gas in high voltage equipment.

Key words: Trifluoroiodomethane; CF_3I; SF_6; Boltzmann equation analysis; Electron transport coefficients; Gas mixture.