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TRANSPORT PROPERTIES OF TWO-TEMPERATURE SF6 AND ITS ALTERNATIVE GASES

GUANYU WANG, BOYA ZHANG and XINGWEN LI

State Key Laboratory of Electrical Insulation and Power Equipment,
Xi'an Jiaotong University, Xi'an 710049, China.
E-mail wangguanyu@stu.xjtu.edu.cn

Abstract. Non-local thermodynamic equilibrium (NLTE) phenomena in plasmas typically have a significant impact on dissociation and ionization reactions, thereby altering the macroscopic transport properties of gases. This study calculates the transport coefficients of SF_6 and environmentally friendly alternative gases such as C_4F_7N, CO_2, and dry air under two-temperature conditions, exploring the influence of NLTE conditions on ionized gases. The results indicate that non-equilibrium phenomena alter the dominant sequence of ionization reactions within the plasma, consequently affecting its transport characteristics. Due to the complexity of the C_4F_7N molecule, it is more significantly affected by NLTE conditions, whereas $CO_2$and dry air are relatively less affected. The two-temperature state influences the transport properties of gases from both the chemical reaction and interaction intensity perspectives; some examples are presented.

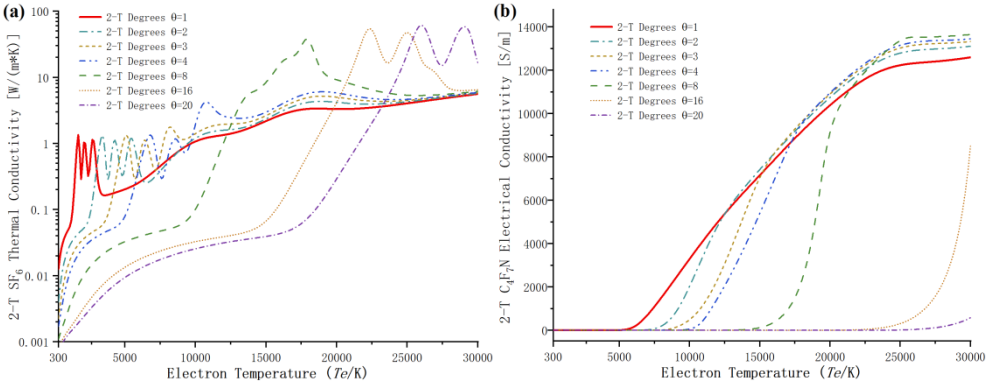

Figure 1: Two-Temperature Transport Properties at 0.1MPa.
(a) Thermal Conductivity, SF_6. (b) Electrical Conductivity, C_4F_7N.