

## DERIVING SWARM PARAMETERS FROM ION KINETICS AND DETERMINING COLLISION CROSS SECTIONS THROUGH DATA-DRIVEN METHODS FOR ECO-FRIENDLY INSULATING GASES

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**Abstract.** SF<sub>6</sub> is a favored insulating gas widely used in electric equipment, but it has a sever greenhouse effect. Recently, significant progress has been made in identifying and testing promising eco-friendly SF<sub>6</sub>-alternative gases, such as C<sub>4</sub>F<sub>7</sub>N, C<sub>5</sub>F<sub>10</sub>O and HFO-1336mzz(E). This study focuses on the determination of their electron swarm parameters and electron-neutral collisional cross-sections. An efficient method is proposed to determine swarm parameters by Pulsed Townsend experiment, considering ion kinetics, including ionization, attachment, electron detachment and ion conversion. Further, a data-driven method was proposed to predict a complete and self-consistent set of electron-neutral collision cross sections of C<sub>4</sub>F<sub>7</sub>N and C<sub>5</sub>F<sub>10</sub>O. All the swarm parameters and cross sections data obtained in this work are available in our LXCat database [www.lxcat.net/XJTUAETLab](http://www.lxcat.net/XJTUAETLab).

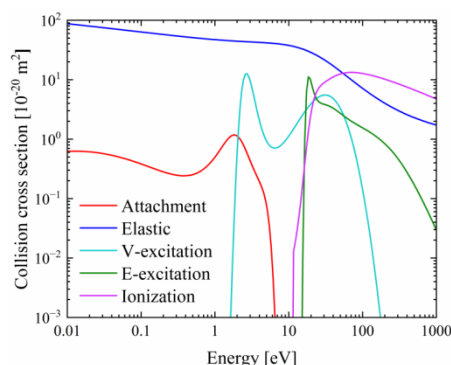


Figure 1: The refined collision cross-section set of C<sub>5</sub>F<sub>10</sub>O.

### References

- Hao, M., Zhang, B., Li X., et al.: 2024, *Plasma Sources Sci. Technol.* **33**, 035005  
Zhang, B., Hao, M., Yao Y., et al.: 2023, *J. Phys. D: Appl. Phys.* **56**, 134001.  
Zhang, B., Liu P., Hao, M., Li X.: 2024, *J. Phys. D: Appl. Phys.* **57**, 375206.