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Low-energy electrons interaction with acetone (CH₃)₂CO in the UV-Vis spectral region

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This study investigates electron collisions (10 –100 eV) with molecular species using emission spectroscopy processes that are fundamental to the chemistry of extraterrestrial environments. Electron-induced chemistry, in which low-energy electrons interact with molecules, plays a crucial role in the study of objects in space and has significant implications for astrochemical research. At the Laboratory of Electron-Induced Fluorescence (LEIF), Comenius University in Bratislava, we recorded the optical emission spectra of acetone under 50 eV electron impact [1]. Prominent spectral features, namely the hydrogen Balmer series, the Swan system, and the CH (A²Δ–X²Π) emission band, were observed in the 280–950 nm wavelength range. Using electron-induced fluorescence, we analyzed the electronic, vibrational, and rotational states of acetone through its emitted radiation. These measurements also provided insight into dissociation and ionization processes and enabled the determination of emission cross-sections. Given acetone's high abundance in astrophysical environments, where it can form or be modified through electron-driven reactions, our results have important astrochemical relevance. The 380 –445 nm region, identified as the most active part of the spectrum, was recorded at higher resolution and corrected for instrumental sensitivity. Individual rotational transitions from the P, Q, and R branches of CH fragments were clearly resolved.

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Reference

1]. B Stachová et al 2025 Phys. Scr. 100 015409.

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