

## Cross Sections for Electron Collisions with Acetylene

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Acetylene (HCCH) is the simplest triply-bonded hydrocarbon molecule and has particular importance in a variety of different plasma processes. For example plasma can be used to make HCCH from coal, natural gas and methane. Conversely acetylene plasmas are used for a variety of chemistry; they are used to make C<sub>2</sub>, CH\*, fullerenes, diamonds, carbon nanoparticles, hydrocarbon nanoparticle, nanotubes and polymers, as well as other chemical processes. Acetylene plasmas are used to provide a variety of different coatings. The role of acetylene in fusion plasmas has also been considered. Acetylene is particular well-known from combustion, where oxy-acetylene flames provide particularly hot (~3000 K) flames which are in routine everyday use.

Acetylene is also an important component of cool carbon-rich stars whose spectra require considerable data to model. This work uses the same methodology as our recent review of electron – methane collision data [1]. However there have been significantly fewer experimental studies of electron -- acetylene collisions. This means that the accuracy for many of the cross sections we recommend is less satisfactory. The accuracy for the measured cross section data for processes involving ground state species is Previous cross section compilations have been published[2,3]. In this paper, we compiled and reviewed the reported data, up to early 2015, of the various cross sections for electron scattering from acetylene. We suggest recommended cross sections for the different scattering processes and identify processes which would benefit from further study.

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2. Shirai, Toshizo and Tabata, Tatsuo and Tawara, Hiroyuki and Itikawa, Yukikazu, Atom. Data Nucl. Data, 80 (2002) 147.
3. Nakamura Yoshiharu, J. Phys. D: Appl. Phys., 43 (2010) 365201.