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Electronic Spectra of Organic Radicals and Ions of Relevance to Combustion and Interstellar Space

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A number of modern approaches of chemical physics and spectroscopy are used to identify for the first time the electronic spectra of reactive intermediates of organic molecules. The reactive species selected are intermediates in terrestrial processes such as combustion of hydrocarbons leading to formation of aromatics, as well as in interstellar environments of diffuse and dark clouds and planetary nebula. The species are produced in situ within supersonic expansions using discharges and laser vaporization and detected in small concentration by laser approaches. The electronic spectra of mass-selected cations at 15 K are measured in a radiofrequency trap following collisional cooling with helium. The gas phase studies are supported by measurements of the electronic absorptions in 6 K neon matrices of mass-selected radicals and ions. The spectroscopic information of the electronic spectra, supported by theoretical calculations, enables the structure of the species to be identified. The knowledge of the electronic transitions provides the means of in situ monitoring of these reactive intermediates in inaccessible environments.

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