IR-SPECTROSCOPY OF PHENYLRADICALS IN HELIUMNANODROPLETS

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The study of aryl radicals is of paramount importance for a different number of reasons. These reactive species are critical intermediates in reactions of explosives and combustion processes, in the generation and the deposition of soot and the formation of organic pollutants [a]. Furthermore these species play an important role in the carcinogenesis and the photocyclic tumour therapy. Based on their high reactivity it is not possible to investigate those substances at room temperature. For this reason previous experimental studies were carried out by embedding the radicals in a low temperature argon matrix [b], [c]. In the present experimental study we wanted to investigate phenyl radicals as a prototype for aryl radicals in helium nanodroplets. In contrast to measurements in an argon matrix (10 K) we were able to get temperatures as low as 0.37 K. Using azobenzene as a precursor the phenyl radicals are generated with the help of a home-made pyrolysis oven at temperatures in the 600 - 1100 K range. The optimization of the phenyl source was carried out by observing the efficiency of the pyrolysis according to changes of different experimental parameters. After obtaining formation of the reactive species and their incorporation into the ultracold helium droplets, the radicals were spectroscopically studied in the spectral region of 3045 cm^{-1} - 3085 cm^{-1}.

[a] J. G. Radziszewski et al., J. Am. Chem. Soc., 1996, 118, 7400-7401
[b] A. V. Friderichsen et al., J. Am. Chem. Soc. 2001, 123, 1977-1988
[c] A. Mardyukov et al., Chem. Eur. J. 2009, 15, 1462 - 1467