

SEMINAIRE LIDYL

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Attention jour et horaire exceptionnels

Le Mercredi 29 Juin 2022 à 14h30
Orme des Merisiers, Bât.701, Pièce 17 (salle de séminaires)

The seminar will be accessible online on Zoom at the following address:
<https://cnrs.zoom.us/j/99004020859?pwd=cEg0YnN4cHpKTEdwaVV2c2hwM3hxQT09>
ID de réunion : 990 0402 0859 / Code secret : 6JEg37

Capturing Transient Species in Ionized Liquid Water and Aqueous Solutions

The ionization of liquid water serves as the principal trigger for a myriad of phenomena that are relevant to radiation chemistry and radiation biology. The earliest events that follow the ionization of water, however, remain relatively unknown.

By employing few-cycle pulses in the visible to near-infrared (500 – 900 nm) and the short-wave infrared (0.9 – 1.7 μm), we have performed a comprehensive probe of the fate of the electron that is initially injected into the conduction band by ionization. The results suggest that the relaxation of the conduction band electron to the hydrated s electron proceeds via an intermediate state, whose lifetime is found to be 62 ± 10 fs (110 ± 5 fs) in H₂O (D₂O).

In complementary experiments, femtosecond soft X-ray free-electron laser probing at the oxygen K edge is employed to track the primary proton transfer reaction of ionized liquid water. The experimental results suggest that H₂O⁺ undergoes proton transfer to yield vibrationally excited OH[·] on the timescale of 46 ± 10 fs. Subsequent vibrational relaxation of OH[·] occurs with a time constant of 0.18 ± 0.02 ps. Our studies of ionized liquid water have also been extended to anion photodetachment in aqueous solution. For example, in the case of phenoxide, which serves as a model for the redox-active amino acid tyrosine, photodetachment launches vibrational wave packet motion along multiple vibrational modes of the phenoxy radical product. Analysis of the vibrational wave packet dynamics reveals the normal modes that drive structural reorganization upon photodetachment. Our results shed light on the elementary ultrafast dynamics that accompany the interaction of ionizing radiation with molecules of biological relevance.