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Strong-field laser induced H_2 roaming reactions and the formation of H_3^+ from organic molecules[1] N. EKANAYAKE, M. NAIRAT, Chemistry Department, Michigan State University, USA, T. SEVERT, P. FEIZOLLAH, B. JOCHIM, B. KADERIYA, F. ZIAEE, K. BORNE, KANAKA RAJU P., K. D. CARNES, D. ROLLES, A. RUDENKO, I. BEN-ITZHAK, J. R. Macdonald Laboratory, Kansas State University, USA, N. P. WEINGARTZ, B. M. FARRIS, J. E. JACKSON, B. G. LEVINE, M. DANTUS, Chemistry Department, Michigan State University, USA — Roaming chemical reactions are a novel chapter in our understanding of certain exotic reactions relevant to molecular physics, photochemistry, and combustion chemistry. A recent finding indicating the involvement of H_2 roaming for the formation of H_3^+ under strong-field photodissociation [Ekanayake, N. *et al. Sci. Rep.* **7**, 4703 (2017)] inspired a series of experiments aimed at elucidating aspects of its mechanisms of formation. In the present study, site-specific details and femtosecond time-resolved dynamics of H_3^+ formation were obtained through a combination of strong-field laser excitation studies and *ab initio* calculations on a series of alcohols. Our findings confirm the mechanisms of this intriguing chemical process involving the cleavage and formation of three chemical bonds and reveal that H_3^+ yields decrease as the alkane chain length increases. This new understanding will aid in the prediction of expected yields and formation times of H_3^+ from different organic molecules.

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