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Coherent control of bond making

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Coherent control of chemical reactions has been suggested more than 30 years ago. However, its experimental demonstration remains an open challenge until today. I will review progress toward coherent control of chemical reactions and explain why it has proven so difficult. Focussing on coherent control of bond making, I will present our recent results on femtosecond photoassociation of hot magnesium atoms [1] and its coherent control [2]. [1] L. Rybak et al., Phys. Rev. Lett. 107, 273001 (2011). [2] L. Levin et al., Phys. Rev. Lett. 114, 233003 (2015).