

Chemistry of the Quantum Kind

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There has been a long-standing quest to observe chemical reactions at low temperatures where reaction rates and pathways are governed by quantum mechanical effects. This field of Quantum Chemistry has been dominated, to date, by theory, with almost no experiments. The difficulty so far, has been to realize in the laboratory low enough collisional velocities between neutral reactants, so that the quantum wave nature becomes a dominant effect. We will discuss how reaction temperatures as low as 10 milli Kelvin can be achieved without laser cooling by merging cold and fast molecular and atomic beams. We will show that at these low collision energies reactions proceed surprisingly fast via tunnelling through potential barriers.