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Quantum defect model of reactive collisions in quasi-1D and quasi-2D traps ZBIGNIEW IDZIASZEK, Faculty of Physics, University of Warsaw, PAUL S. JULIENNE, Joint Quantum Institute, NIST and the University of Maryland, ANDREA MICHELI, GUIDO PUPILLO, MIKHAIL BARANOV, PETER ZOLLER, Institute for Theoretical Physics, University of Innsbruck and IQOQI, Austrian Academy of Sciences — We study reactive collisions of ultracold molecules in quasi-one-dimensional and quasi-two-dimensional traps. Based on the quantum defect model developed for reactive collisions in three dimensions [1], we derive analytic results for elastic and loss rates induced by some short-range reaction process. Our model is characterized by two dimensionless quantum defect parameters: y and s. The former describes probability of reaction, and the latter gives the phase of the wave function at short range. For y close to unity we obtain universal collision rates determined only by the quantum reflection process from the long-range potential, and dependent only on the van der Waals coefficient and the trap frequency. At small reaction probabilities the collision rates are not universal and exhibit resonances induced by the confining potential. We discuss generalization of our model to include dipole-dipole interactions for collisions of polar molecules and present results for reactive dipolar collisions in quasi-two-dimensional systems.
[1] Z. Idziaszek and P. S. Julienne, arXiv:0912.0370.

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