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Magnetic field modification of ultracold molecule-molecule collisions T.V. TSCHERBUL, Harvard University, YU.V. SULEIMANOV, Moscow State University, Russia, V. AQUILANTI, University of Perugia, Italy, R.V. KREMS, University of British Columbia, Vancouver, Canada — We present an accurate quantum mechanical study of elastic scattering and spin relaxation in collisions of $O_2(^3\Sigma_g^-)$ molecules at cold and ultracold temperatures in the presence of a magnetic field. Our calculations show that magnetic spin relaxation in molecule-molecule collisions is extremely efficient except at magnetic fields below 10 G. The magnetic field dependence of elastic and inelastic scattering cross sections at ultracold temperatures is dominated by a manifold of Feshbach resonances with the density of $\sim$100 resonances per Tesla for collisions of molecules in the absolute ground state. This suggests that the scattering length of ultracold molecules in the absolute ground state can be effectively tuned in a very wide range of magnetic fields. Our calculations demonstrate that the number and properties of the magnetic Feshbach resonances are dramatically different for molecules in the absolute ground and excited spin states.

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