Dynamic rotational effect in reaction of SiO^+ super rotors with H_2

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Super rotors are molecules rotating at very high speed, whose rotational energy may approach or exceed electronic bonding energy. Steady-state silicon monoxide cation (SiO^+) super rotors with rotational quantum numbers N up to 170 were prepared in a linear quadrupole trap by means of optical pumping. Our measurements showed that the rate of reaction of SiO^+ super rotors with molecular hydrogen increased by a factor of 3 compared to thermal SiO^+ molecules. Quasiclassical trajectory (QCT) calculations explained the observed rate increase by a dynamic effect via coupling of SiO^+ rotational motion to a reaction coordinate of the intermediate reaction complex.