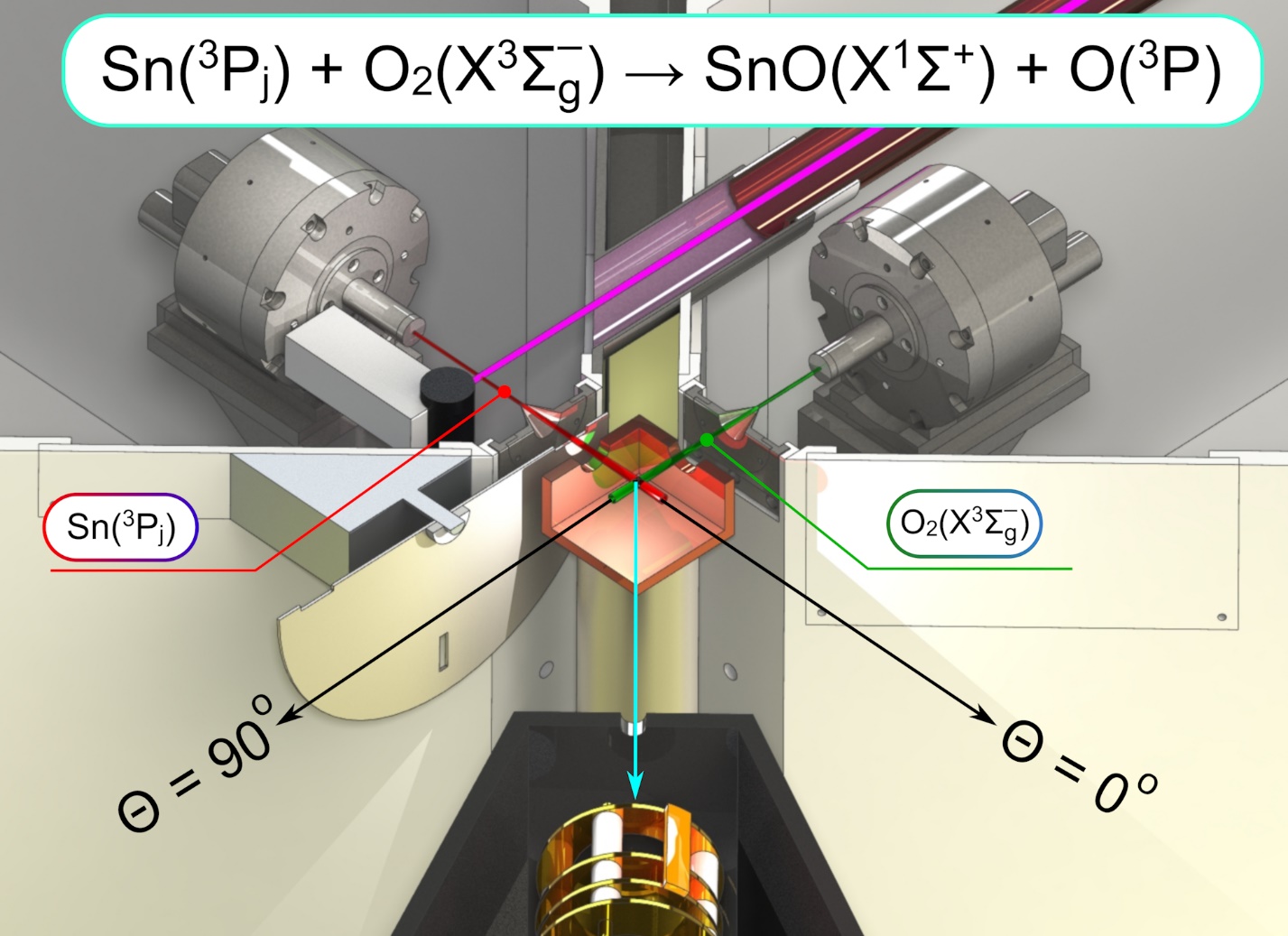
**TOC**



In this article, we combine state-of-art electronic structure calculations and crossed beam experiments to expose the reaction dynamics in the tin (Sn, 3Pj) − molecular oxygen (O2, X3), thermodynamic analysis of our experimental results proves the observation of reaction with stated electronic and spin-orbit levels: 120Sn(3Pj) + 16O2(X3) → 120Sn16O(X1+) + 16O(3P). The studied reaction follows a mechanism parallel to that for the gas phase reaction of germanium and silicon with molecular oxygen, however, the presence of the tin atom enhances and expands ISC via the “heavy atom effect”.