THE PURE ROTATIONAL SPECTRA OF ZnO IN THE EXCITED $a^3\Pi_i$ STATE

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The pure rotational spectra of ZnO in the excited $a^3\Pi_i$ electronic state have been measured using direct absorption sub-millimeter techniques. This molecule was synthesized by reacting zinc vapor with N_2O in the presence of a DC discharge. Nine rotational transitions were recorded for the ^{64}ZnO, ^{66}ZnO, and ^{68}ZnO isotopomers in the v=0 state and data for the main isotopomer was measured in the v=1 state. All three spin components were observed for this state, each exhibiting lambda-doubling. The data were fit with a Hund case(a) Hamiltonian and rotational, spin-orbit, spin-spin, and lambda-doubling constants established. A bond length of 1.8436 Å was determined for this excited state, which is about 0.14 Å larger than that of the ground state.