MEASUREMENT OF THE ELECTRIC DIPOLE MOMENTS OF CERIUM AND PRAESODYMIUM MONOXIDES [a]

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The diatomic oxides of the lanthanides and actinides have many low-lying electronic states due to the presence of open f and d orbitals on the metal. The magnetic and electric tuning of the fine structure is an effective means of identifying the dominant configuration of a particular electronic state. Here we report on the first high-resolution molecular beam measurements of the Stark effect in electronic transitions of cerium monoxide, CeO and praseodymium monoxide, PrO. Numerous branch features in the [16.5] (Ω=2) - $X_1(\Omega=2)$ and [16.5] (Ω=2) - $X_2(\Omega=3)$ electronic transition of CeO and [16.6] (Ω=5.5) - $X_1(\Omega=4.5)$ transition of PrO were recorded at near natural linewidth limit (FWHM $<$ 50MHz) field free and in the presence of tunable static electric fields. The Stark splitting and shifts were used to extract values for the magnitudes of the permanent electric dipole moments of the electronic states. The results for the ground state will be compared with those of other lanthanide oxides to examine the effect on the dipole moment of adding f electrons to the metal ion core on proceeding across the lanthanide group from lanthanum to ytterbium.

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