

Abstract

THE STARK EFFECT IN COLOR CENTERS
OF ALKALI HALIDES

by

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The Stark effect of the F center in NaCl, NaBr, KCl, KBr, KI, and RbCl, the M center in KCl, and the Z_1 center in KCl:Sr was measured using an ac electric field. The fractional change of the absorption coefficient, $\Delta\alpha/\alpha$, at the peak of the F band, normalized to a Lorentz local field of 200 kV/cm, was found to be approximately 2×10^{-5} for NaCl and NaBr, 11×10^{-5} for RbCl, and 17×10^{-5} for KCl, KBr, and KI. A simple continuum model is presented which qualitatively relates the effect to the nearest-neighbor separation and an effective dielectric constant. The Stark effect at the peak of the M band in KCl was $3.9 \pm 0.4 \times 10^{-5}$ for an applied electric field of 97 kV/cm. A measurement of the change in the absorption coefficient, $\Delta\alpha$, versus photon energy produced a nonsymmetrical curve. This indicates that the effect observed was not the linear Stark effect and thus provides additional evidence that Seitz's model is incorrect. The absorption coefficient increased at energies lower than the M band corresponding to a decrease in the absorption coefficient of the M band. The effect is

attributed to the mixing of two nondegenerate energy levels of opposite parity. The optical transition to the level of lower energy is normally forbidden. The Z_1 center in KCl:Sr did not exhibit a detectable Stark effect. It was determined, however, that $\Delta\alpha/\alpha < 8 \times 10^{-6}$ for an applied electric field of 97 kV/cm. If the Z_1 possesses a permanent dipole moment, the difference between the expectation values of dipole moment in the ground state and excited state is less than 1.0×10^{-20} cgs unit.

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