Transport properties and finite size effects in ß-Ga_2O_3 thin films

R. Ahrling, J. Boy, M. Handwerg, O. Chiatti, R. Mitdank, G. Wagner, Z. Galazka, and S. F. Fischer
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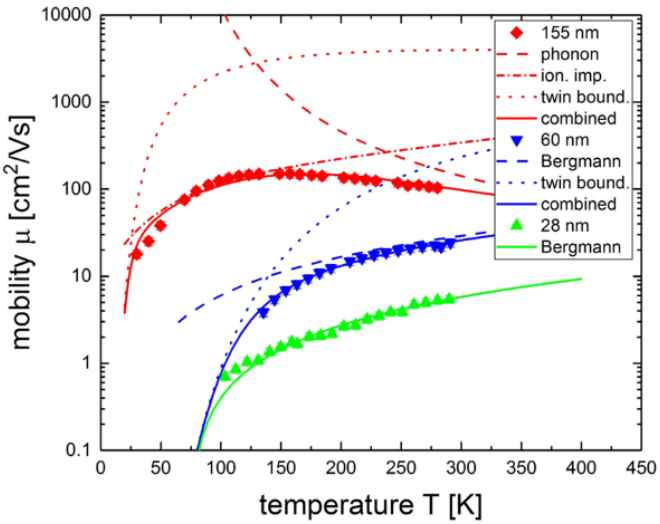
Short Abstract

Here, we perform temperature and film thickness dependent measurements on homoepitaxially grown β-Ga_2O_3-films. The thicker MOVPE-grown films (ca. 200 nm) have a mobility comparable to bulk crystals. Even the thinnest films (28 nm) have a high enough conductivity to be electrically useable at room temperature. We discuss a film thickness-dependent model for the electron mobility. For the thinnest films, the mobility is not limited by the defect density in the high quality crystals but rather by a finite-size effect of the films. The conductivity is thus best described by the Bergmann model. For the thicker films improvements in crystal growth can still increase mobility values.



Above. Mobility vs. temperature from different thickness ranges showing an overview of the dominant scattering mechanisms. Phonon, ionized impurity and twin boundary scattering play a role in the thick films, twin boundary and Bergmann scattering for the intermediate films and for the thin films, only the Bergmann part is dominant.