

## Infrared ellipsometry study of the confined electrons in a high-mobility $\gamma$ -Al<sub>2</sub>O<sub>3</sub>/SrTiO<sub>3</sub> heterostructure - DTU Orbit (08/11/2017)

### Infrared ellipsometry study of the confined electrons in a high-mobility $\gamma$ -Al<sub>2</sub>O<sub>3</sub>/SrTiO<sub>3</sub> heterostructure

With infrared ellipsometry we studied the response of the confined electrons in  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>/SrTiO<sub>3</sub> (GAO/STO) heterostructures in which they originate predominantly from oxygen vacancies. From the analysis of a so-called Berreman mode, that develops near the highest longitudinal optical phonon mode of SrTiO<sub>3</sub>, we derive the sheet carrier density,  $N_s$ , the mobility,  $\mu$ , and the depth profile of the carrier concentration. Notably, we find that  $N_s$  and the shape of the depth profile are similar as in LaAlO<sub>3</sub>/SrTiO<sub>3</sub> (LAO/STO) heterostructures for which the itinerant carriers are believed to arise from a polar discontinuity. Despite an order of magnitude higher mobility in GAO/STO, as obtained from transport measurements, the derived mobility in the infrared range exhibits only a twofold increase. We interpret this finding in terms of the polaronic nature of the confined charge carriers in GAO/STO and LAO/STO which leads to a strong, frequency-dependent interaction with the STO phonons.

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