

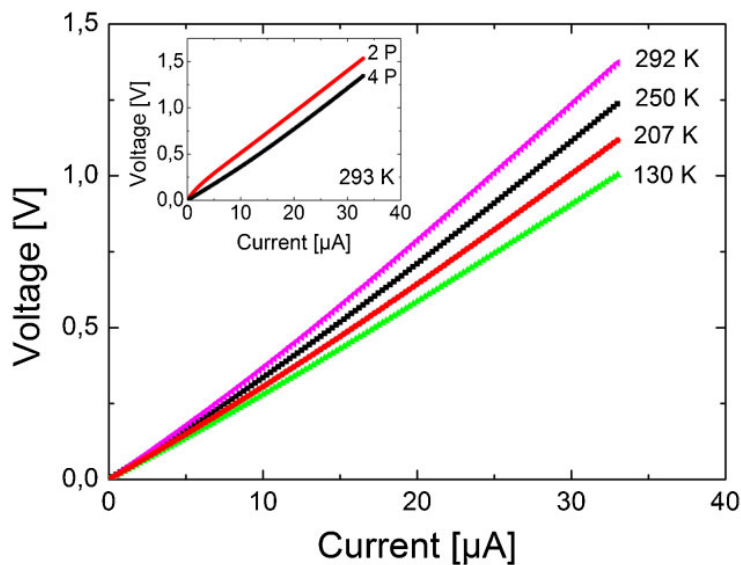
Temperature-dependent electrical characterization of exfoliated $\beta\text{-Ga}_2\text{O}_3$ micro flakes

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Short Abstract

Among the transparent semiconducting oxides, $\beta\text{-Ga}_2\text{O}_3$ is of high interest because of its wide band gap of 4.8 eV and the corresponding transparency from deep ultraviolet to near infrared spectra. Here, we report on the preparation, structural and temperature-dependent electrical characterisation of thin $\beta\text{-Ga}_2\text{O}_3$ micro flakes. Transport investigations were performed in the temperature range from 30 to 300K. The electrical resistivity at room temperature amounts to $\rho(293\text{ K})=(1.5\pm 0.5)\Omega\text{cm}$. The temperature-dependent resistivity has a minimum at $T=130\text{ K}$ of about $\rho(130\text{ K})\sim 1\Omega\text{cm}$. From the increase of $\rho(T)$ between 130 and 300K we determine an activation energy of $E_a=(-10.5\pm 0.4)\text{ meV}$. For temperatures below 50K $\rho(T)$ increases indicating a freeze-out of charge carriers.



Above. Voltage-current characteristics for a $\beta\text{-Ga}_2\text{O}_3$ 190 nm thin flake measured in four-point geometry at temperatures from 130K up to 300 K: The resistance increases with increasing temperature. Inset: Comparison of two- and four-point measurements at 300 K. At currents above 20mA the determined resistances are identical.