On the novel wide band-gap semiconductors AlN and β-Ga_2O_3: Bulk crystal growth, homoepitaxy, properties and applications

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Wide band-gap semiconductors such as SiC and GaN have successfully been adopted in commercial technology, but the next generation of materials is already intensively studied. AlN is the most promising substrate material for deep-UV optoelectronics, which is based on AlGaN epitaxial layers with high Al content. On the other hand, β-Ga_2O_3 provides an extremely high breakdown field useful for power electronics. However, novel challenges in bulk growth for substrate preparation, (homo)epitaxy technology, processing and device design must yet be overcome for both materials to reach commercial application. In this seminar, I will briefly introduce research at the Leibniz Institute for Crystal Growth (IKZ) and mainly discuss the status and remaining challenges of bulk growth of AlN [1] and β-Ga_2O_3 [2]. But I will also provide a brief introduction to homoepitaxy and first device results. Results obtained at the IKZ and its partner institutes will be detailed and compared to the international status of research.

[1] C. Hartmann et al., CrystEngComm 18 (2016) 3488-3497

[2] Z. Galazka et al., ECS J. Solid State Sci. Technol. 6 (2017) Q3007-Q3011