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**Intact transfer of GaN-based devices via an h-BN release layer: insights from first-principles study** GAOXUE WANG, Michigan Tech Univ, MINGSU SI, Lanzhou University, HAIYING HE, Valparaiso University, RAVINDRA PANDEY, Michigan Tech Univ, MINGSU SI TEAM, RAVINDRA PANDEY TEAM — As a promising material for the next-generation optoelectronic devices, most of high quality GaN films can only be grown on sapphire substrates at present. There is an urgent need of finding ways to transfer GaN to flexible substrates owing to the poor thermal conductivity of sapphire substrates, which has largely impeded the proper functioning and the large-scale fabrication of GaN-based devices. Recently, mechanical transfer of GaN-based devices using h-BN (Nature 484, 223 (2012)) as the release layer was proposed. In this study, we investigate the transfer mechanism by mapping out the interlayer sliding energy landscape at each interface of the heterostructures composed of GaN/BN/substrate together with the multi-layered BN based on first-principles calculations. A nearly free sliding path is predicted for the BN bilayer, while much higher energy barriers are predicted for hetero-interfaces. Thus, the mechanism, which is well described by the registry index model, shows that an easier slip can occur through the layered BN while the rest of the heterostructure remains intact.

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