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Hydrogen Surfactant Effect on ZnO/GaN Heterostructures Growth¹ JINGZHAO ZHANG, YIOU ZHANG, KINFAI TSE, JUNYI ZHU, Chinese Univ of Hong Kong — To grow high quality heterostructures based on ZnO and GaN, growth conditions that favor the layer by layer (Frank-Van der Merwe) growth mode have to be applied. However, if A wets B, B would not wet A without special treatments. A famous example is the epitaxial growth of Si/Ge/Si heterostructure with the help of arsenic surfactant in the late 1980s. It has been confirmed by the previous experiments and our calculations that poor crystal quality and 3D growth mode were obtained when GaN grown on ZnO polar surfaces while high quality ZnO was achieved on (0001) and (000-1)-oriented GaN. During the standard OMVPE growth processes, hydrogen is a common impurity and hydrogen-involved surface reconstructions have been well investigated experimentally and theoretically elsewhere. Due to the above facts, we proposed key growth strategies by using hydrogen as a surfactant to achieve ideal growth mode for GaN on ZnO (000-1) surface. This novel strategy may for the first time make the growth of high quality GaN single crystal on ZnO substrate possible. This surfactant effect is expected to largely improve the crystal quality and the efficiency of ZnO/GaN super lattices or other heterostructure devices.

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