



# Fabrication of GaN nanowalls and nanowires using surface charge lithography

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## Abstract

We demonstrate the possibility for controlled nanostructuring of GaN by focused-ion-beam treatment with subsequent photoelectrochemical (PEC) etching. The proposed maskless approach based on direct writing of surface negative charge that shields the material against PEC etching allows fabrication of GaN nanowalls and nanowires with lateral dimensions as small as 100 nm. The results obtained show that the occurrence of undercut etching inherent to gallium nitride PEC etching depends on the depletion length in doped GaN material, it being nearly fully suppressed in the structures below a critical size of about 200 nm for the investigated GaN layer of doping concentration of  $1.7 \times 10^{17} \text{ cm}^{-3}$ .