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**Deep Gallium Nitride Etching** JULIEN LADROUE, GREMI - STMicroelectronics, MOHAMED BOUFNICHEL, STMicroelectronics, THOMAS TILLOCHER, GREMI, PHILIPPE LEFAUCHEUX, PIERRE RANSON, RÉMI DUSSART, GREMI — Due to the power density supplied to the next generation of power devices, deep structures as high as 10 $\mu$m should be build. Deep GaN etching implies etch rate issue as well as surface roughness defects. We showed that these etching defects are linked with dislocations inherent to the substrates and revealed during etching. For a better understanding of the etching mechanisms, optical emission spectroscopy, Langmuir probe and mass spectrometry are carried out as a function of process parameters. We observe that etching behaviour depends on coverplate material. An optimum etch rate as a function of source power is measured by using a silicon coverplate. Diagnostics suggest that silicon coverplate etching in chlorine plasmas consume Cl radicals which play a role on GaN etching. Different chemistries are studied as source of active species, sputtering ions or molecule scavenging impurities. We have shown that oxygen impurities are at the origin of columnar defects. We also showed that adding a small amount of nitrogen in the chemistry could increase the selectivity with $SiO_2$ mask.

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