

Hall-effect measurement process

Part I: Sample preparation

For Hall tests on GaN, In pellets are used as ohmic metal contacts. Below, we describe metal contact fabrication using In metal balls. The In metal pellets are 99.99 % pure with a metal ball diameter of about 1 mm.

The procedure below follows sampling cleaving and dopant activation (for p-type GaN and AlGaN). Generally the dimension of the test sample is about 1 cm × 1 cm.

1. Turn on hot stage, set temperature to 325°C.
2. Put sample on the glass plate with the epi layer up.
3. Pick up In ball with tweezers and put on glass plate.
4. Optional step: Remove In surface oxide by etching In balls in 75 % H₂O + 25 % HCl solution for 30 sec.
5. Press In ball by using a microscope slide horizontally, then cut In Ball into two equal pieces.
6. Put two In balls on two corners of the sample.
7. Follow previous steps for In balls on remaining two corners of sample.
8. Press 4 In balls on the sample with microscope slide to make them stick to sample.
9. Put sample (without glass slide) on hot stage. Once In melts, move sample back to the glass slide and press In balls on sample to get a good contact.
10. Put sample on the hot stage for 2 minutes.
11. Pick up the sample and put on a glass slide.
12. Sample is now ready for Hall-effect measurement.

Part II: Hall-effect measurement

1. Turn on Accent HL5500IU Hall system instrumentation unit.
2. Open unit and put sample in unit and probe sample. Then close unit.
3. Turn on computer and run program 'Hall'.
4. Open [File] → [Sample] popup menu.
5. Select [Geometry] folder and select 'Van der Pauw'; input thickness of the top sample layer into [dimensions] → [thickness].

6. Select [Logfile] folder and click 'Open new Logfile' to input the new file name.
7. Open [Configure] → [measurement] popup menu.
8. Input '1 mA' into 'Current'.
9. Input '200 mV' into 'Target Vr'.
10. Click 'Set' button to find the highest current you can get for 200 mV.
11. If you get 'successful', continue with next step. Otherwise, open unit, probe sample again, and then go back to step 7.
12. Open [Measure] → [Check contact] popup menu to measure the contact resistance.
13. If the contact resistance values are *not* similar then open [Configure] → [Blast contacts] popup menu and adjust the contact resistance by applying some bias voltage on contacts.
14. Open [Measure] → [IV curve] popup menu to measure IV characteristic of the sample.
15. Open [Measure] → [Resistivity] popup menu to measure the resistance of the sample.
16. Open [Measure] → [Hall] popup menu to get the Hall coefficient of sample.
17. Close logfile and remove sample.
18. Close software and close unit.
19. Switch off computer and instrumentation unit.

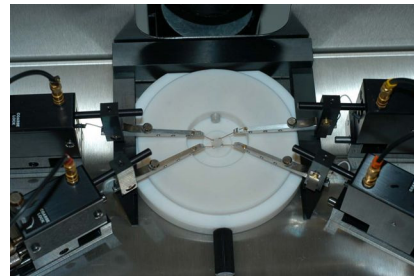


Fig. 1: Hall-effect setup – top view



Fig. 2: Hall-effect setup – side view