

Fig. 1 Scanning electron microscopy (SEM) image of a mixture of gold nanoparticles (Au NPs) and liquid crystal (8CB) transferred to a silicon plate using the Langmuir-Blodgett technique at a surface pressure of 15 mN/m, after prior compression to 18 mN/m. The surface ratio of Au NPs : 8CB is 1:9. The scale bar is 20 μm .

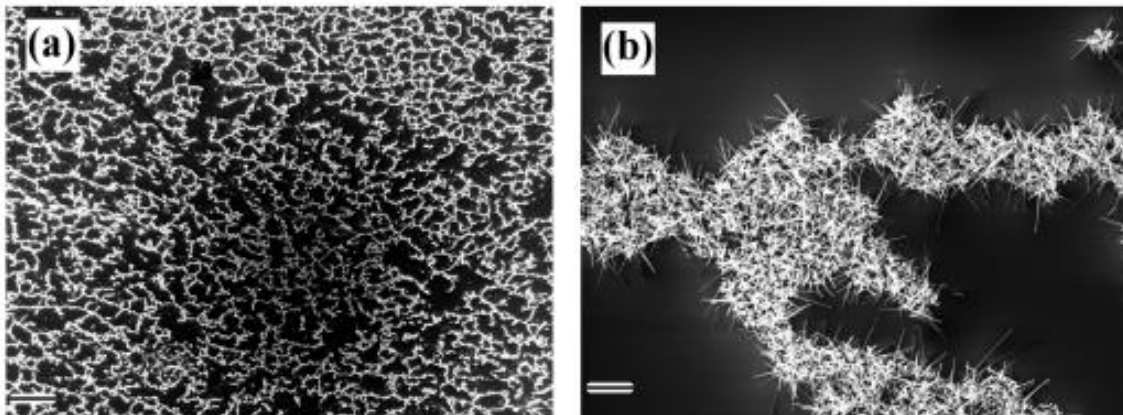


Fig. 2 SEM images of a surface covered with a 2D network of AuNPs (surface ratio of AuNPs : 8CB equal 1:9; transferred to solid substrate at surface pressure of 15 mN/m, after initial compression to 18 mN/m) used as a substrate for chemical vapor deposition (CVD) of gallium nitride, GaN. Gold acts as a catalyst in the CVD process, hence the nanowires are only formed in the places where the NPs have been previously present. Scale bar a) 100 μm , b) 2 μm .

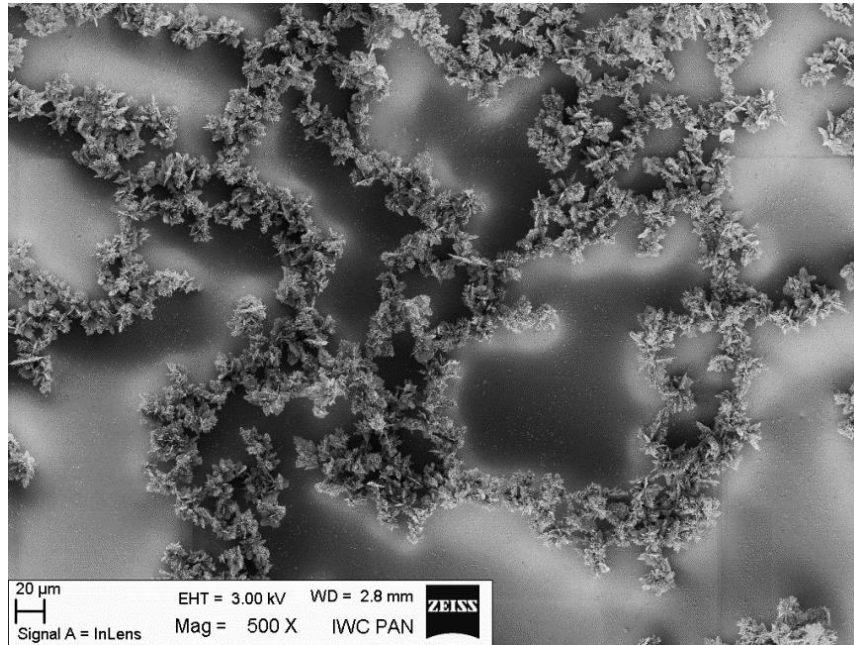


Fig. 3 SEM image of a structure formed due to deposition of gold microflowers (Au MFs) on the surface covered with GaN nanowires. As a solid substrate for deposition of nanowires a 2D network of Au NPs was used. The Au NPs acted as a catalyst for nanowire growth. The parameters of the Au MFs deposition process were tuned so that the extent of surface coverage with the MFs was relatively low.

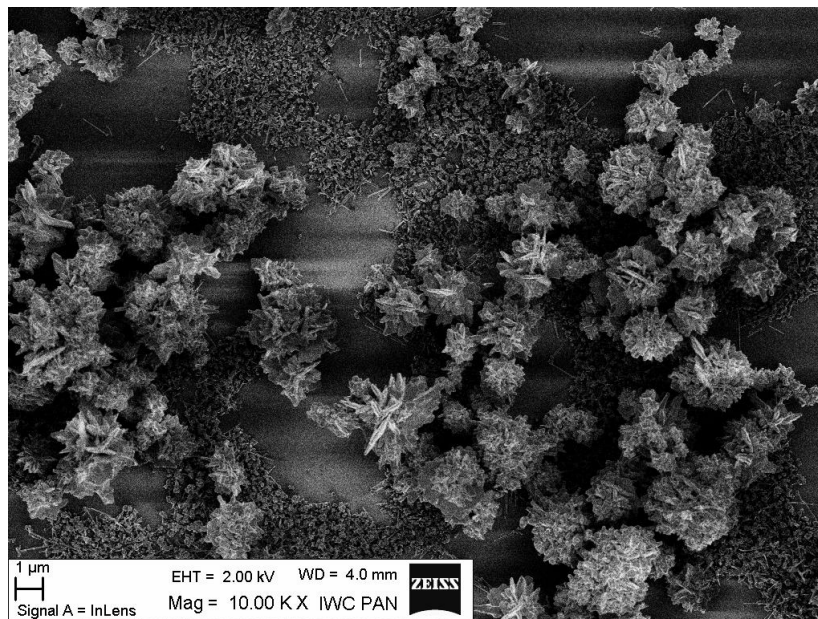


Fig. 4 High-magnification SEM image of Au MFs deposited on the GaN nanowires grown on the 2D network of Au NPs.

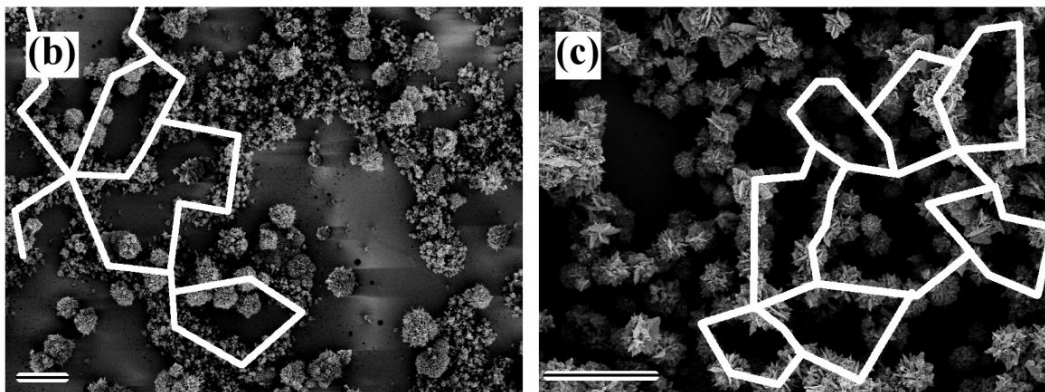
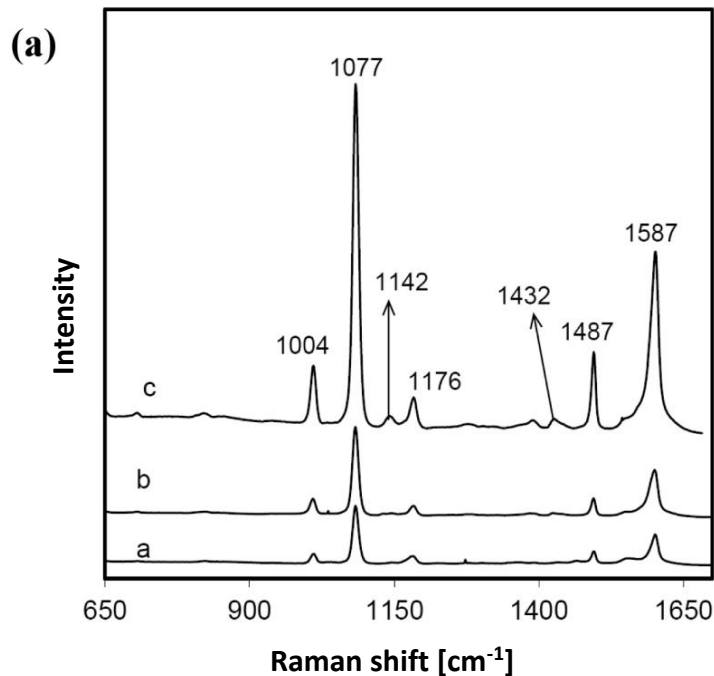


Fig. 5 a) Surface enhanced Raman spectroscopy (SERS) spectrum of 4-aminothiophenol(p-ATP) registered on surfaces *a*, *b*, and *c*, fabricated using the three-stage procedure. Surfaces *a*, *b*, and *c* are based on 2D structures of Au NPs (transferred to solid substrate at surface pressure of 15 mN/m, after prior compression to 18 mN/m; surface ratio of Au NPs : 8CB equal 1:9), used as substrate for GaN nanowire growth and subsequent deposition of Au MFs. The surfaces differ in the extent of Au MF coverage (from *a* – lowest to *c* – highest). b), c) SEM images of samples *b* and *c*, respectively; scale bar 10 μm . White lines in the images denote the primary 2D Au NP network, where the Au MFs are preferentially deposited.

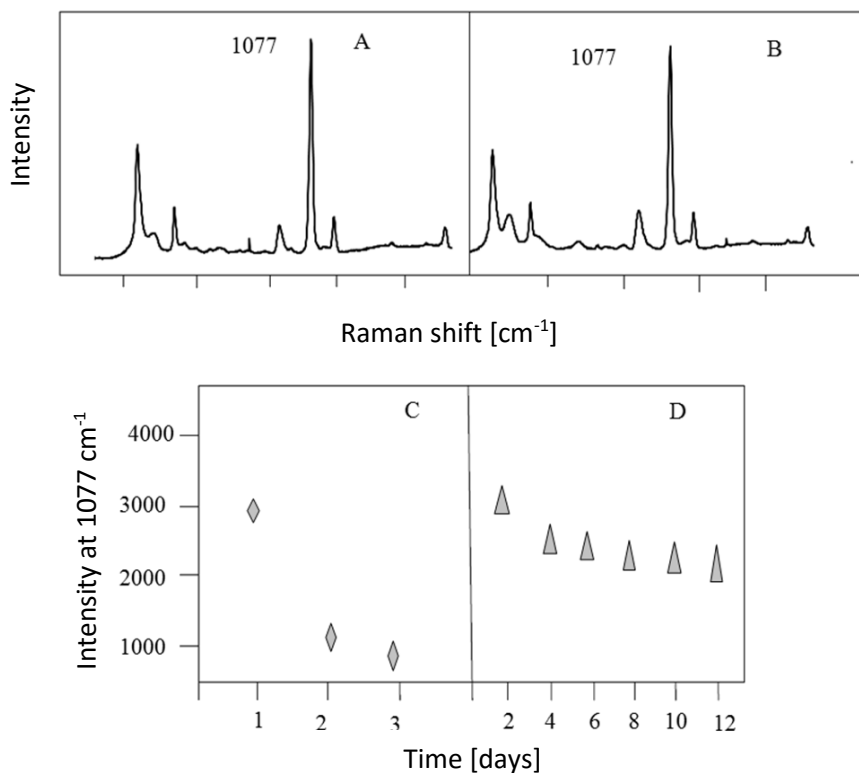


Fig. 6 A, B: SERS spectra of 4-aminothiophenol (p-ATP) recorded immediately after fabrication of the platforms: A – Au MFs deposited directly on roughened silicon; B – Au MFs deposited on the 2D Au NP network / GaN nanowires structure (sample c). The extent of coverage of the surface with the Au MF was very similar (same deposition parameters). The spectra were then acquired every 24 hours (samples were kept in the p-ATP solution). Plots C and D show the changes in the intensity of the 1077 cm⁻¹ band of p-ATP on platforms A and B, respectively. Platform B is stable for at least 12 days, while all previously known platforms based on Au MFs became practically inactive in SERS after 3 days.

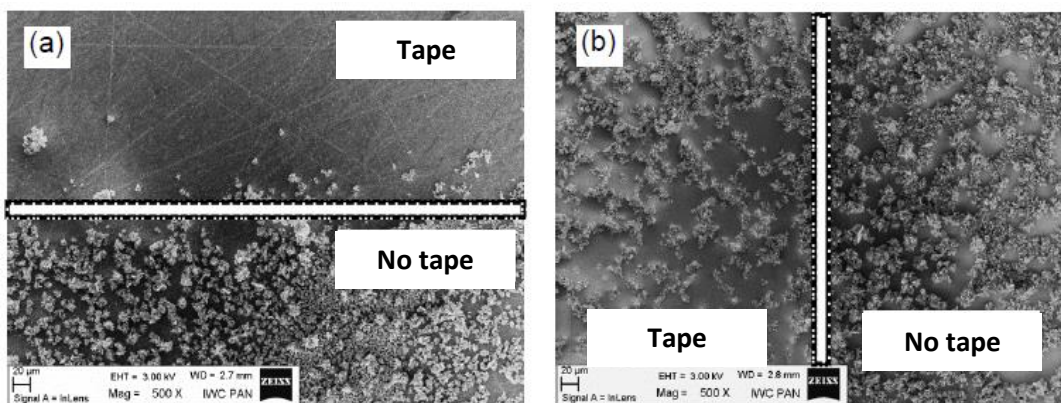


Fig. 7 Comparison of the surface morphology before and after the “scotch tape test” for Au MF-based platforms. (a) Au MFs deposited on roughened silicon; (b) offered 3-step procedure. Extent of surface coverage as in sample b.