Ammonia Plasma-Catalytic Synthesis using Low Melting Point Alloys

Javishk R. Shah [1], Joshua M. Harrison[1] and Maria L. Carreon [1,*]

[1] Russell School of Chemical Engineering, The University of Tulsa, 800 S Tucker Dr, Tulsa, OK – 74104, US.
* Correspondence: maria-carreon@utulsa.edu; Tel.: +1-918-631-2424

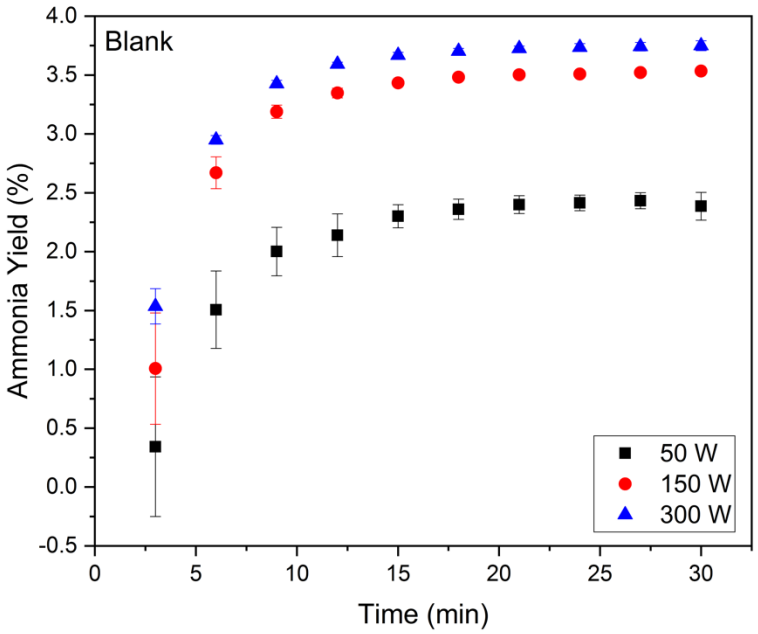

Figure S1. Ammonia Yield (%) vs. Time (min) for reactions run with no catalyst.

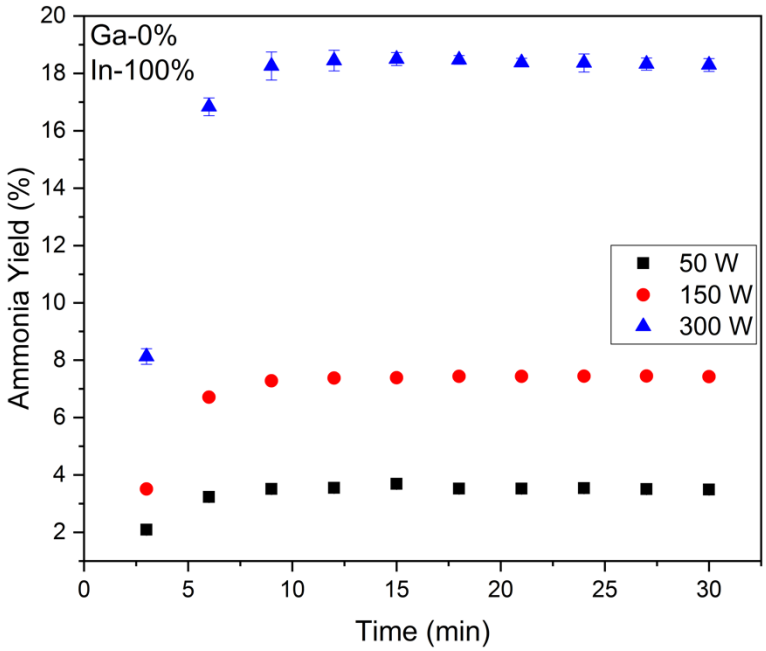

Figure S2. Ammonia Yield (%) vs. Time (min) for reactions with pure In as catalyst.

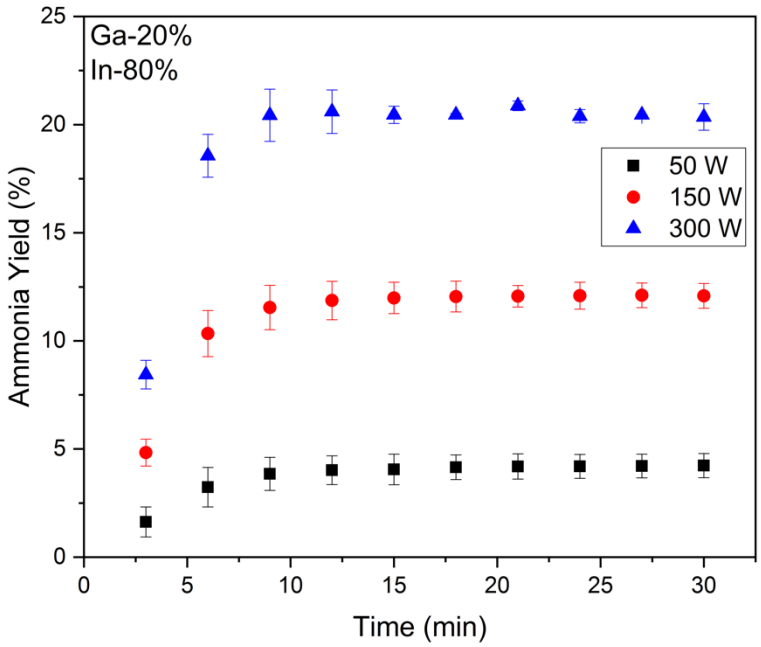

Figure S3. Ammonia Yield (%) vs. Time (min) for reactions run with Ga-In Alloy (20:80).

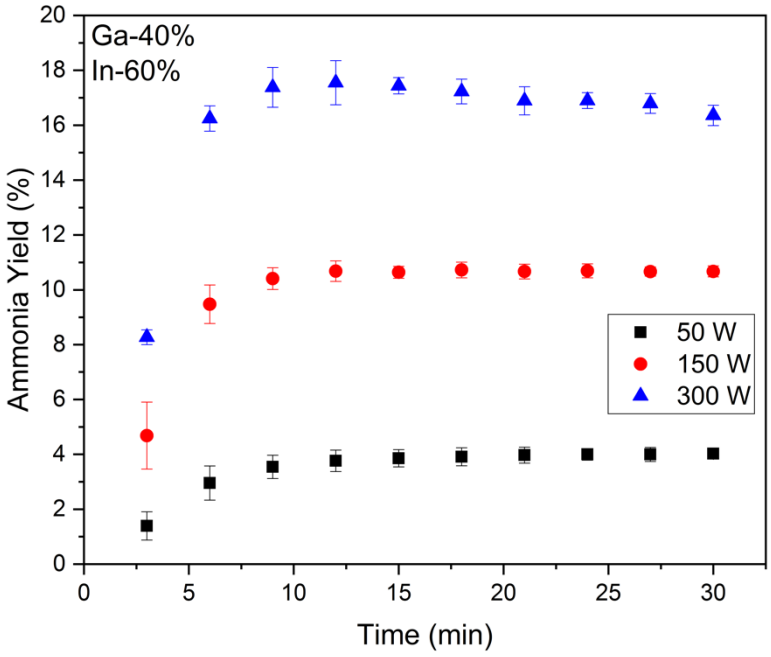

Figure S4. Ammonia Yield (%) vs. Time (min) for reactions run with Ga-In Alloy (40:60).

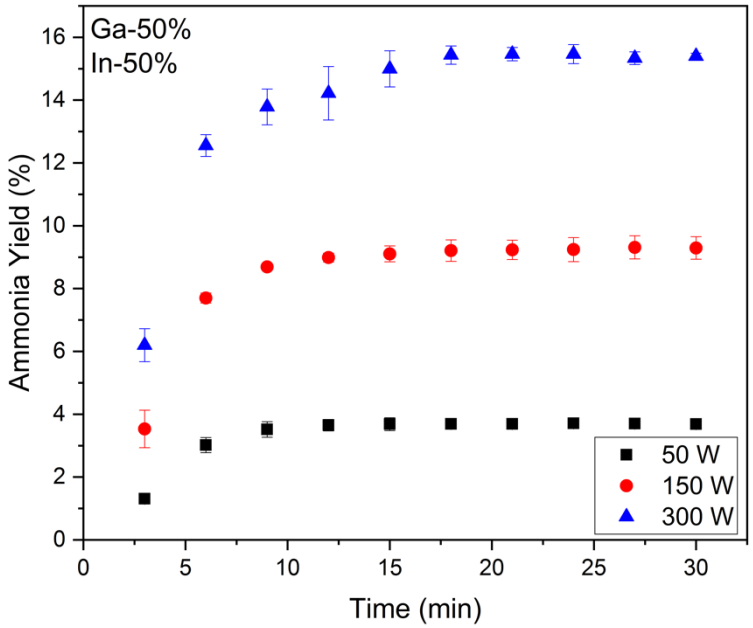

Figure S5. Ammonia Yield (%) vs. Time (min) for reactions run with Ga-In Alloy (50:50).

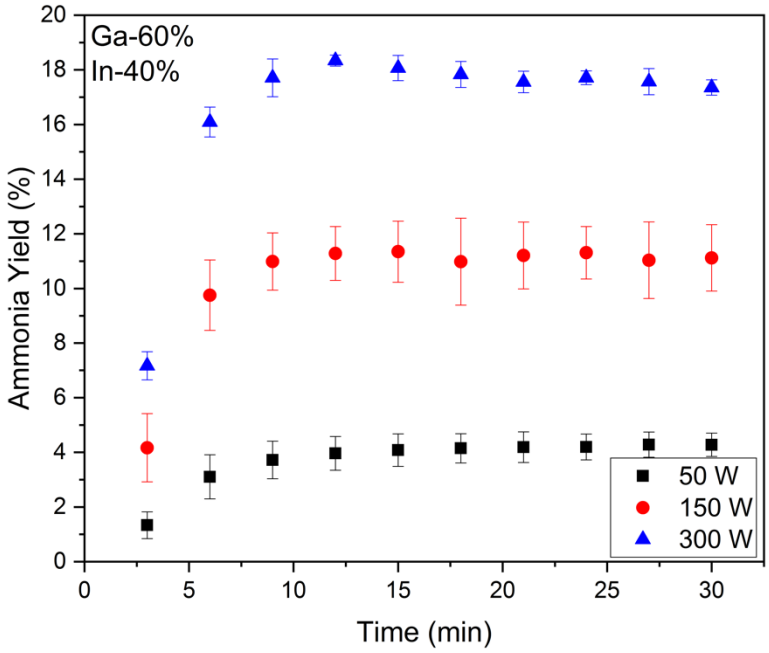

Figure S6. Ammonia Yield (%) vs. Time (min) for reactions run with Ga-In Alloy (60:40).

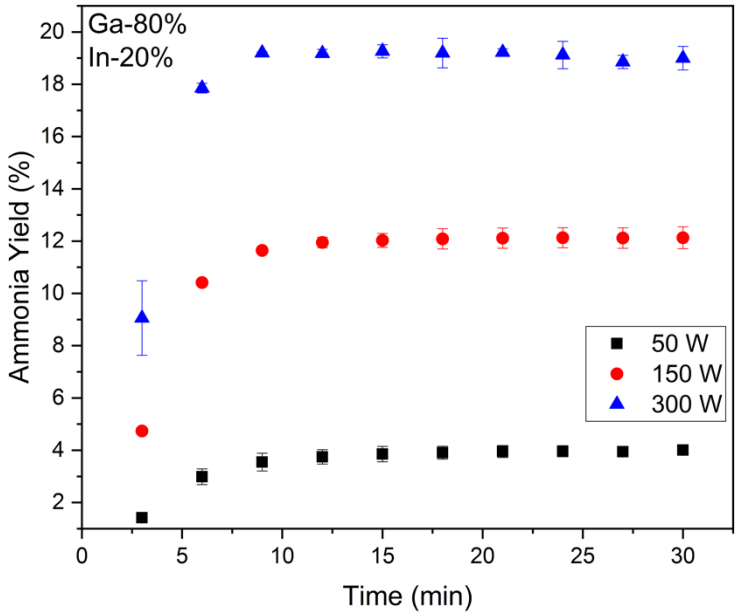

Figure S7. Ammonia Yield (%) vs. Time (min) for reactions run with Ga:In Alloy (80:20).

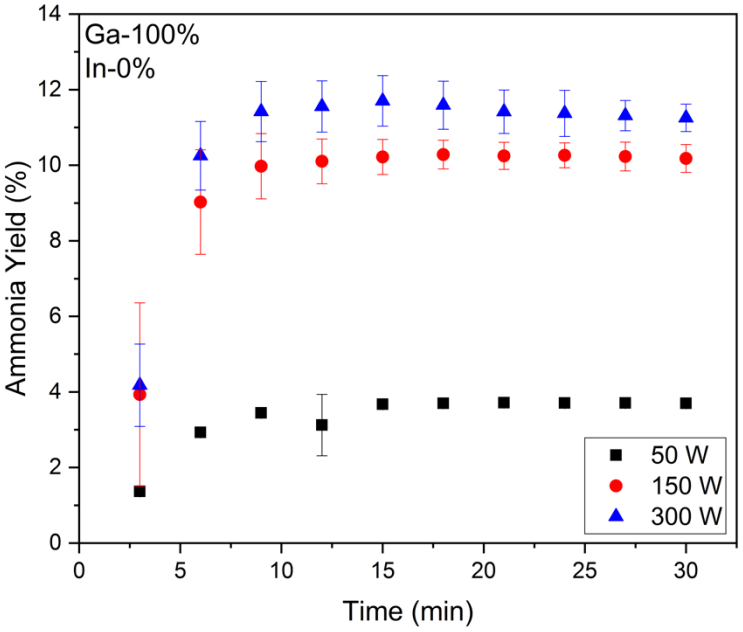

Figure S8. Ammonia Yield (%) vs. Time (min) for reactions run with pure Ga as catalyst.

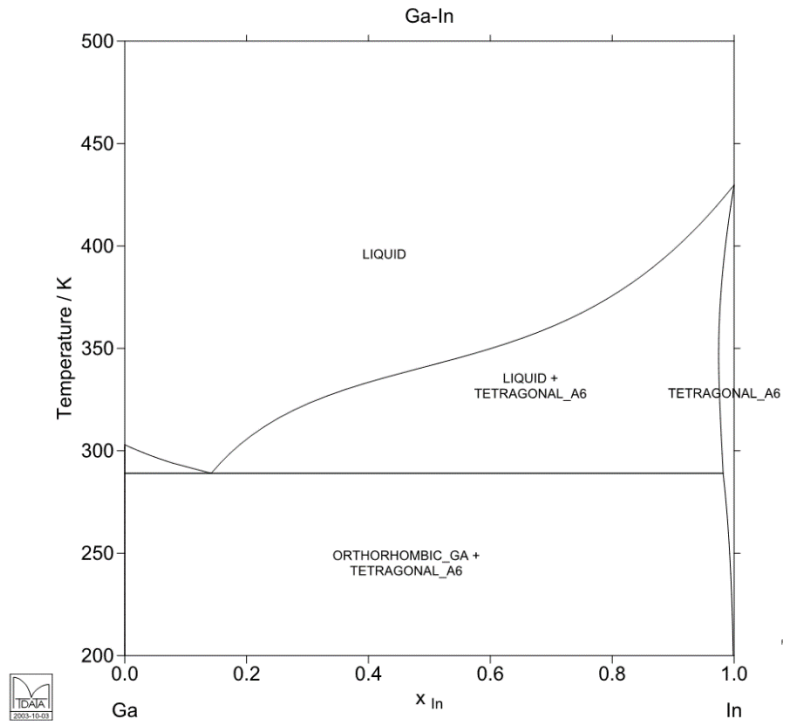

Figure S9. Ga-In Alloy Phase diagram.[1]

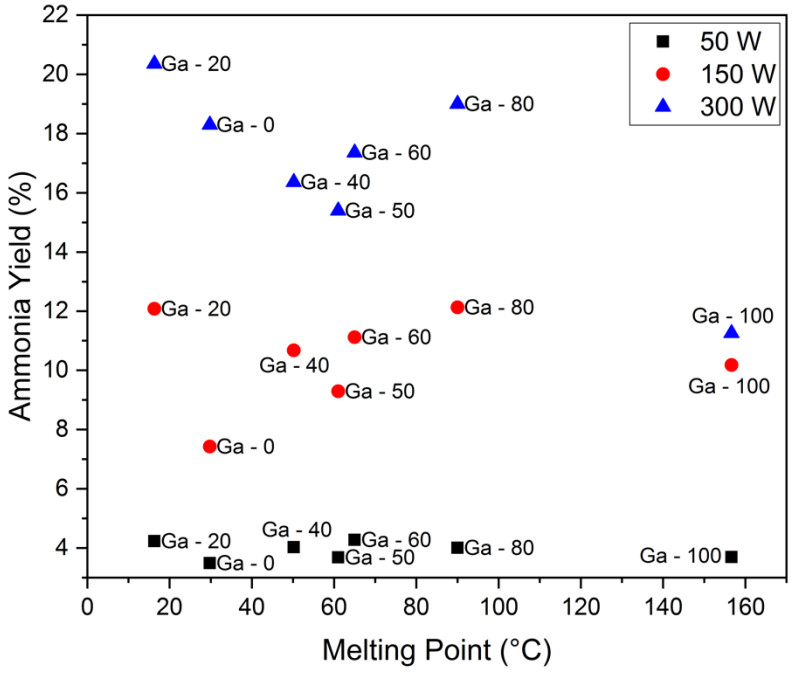

Figure S10. Ammonia Yield (%) vs. Alloy Melting Point (°C) for various plasma powers.

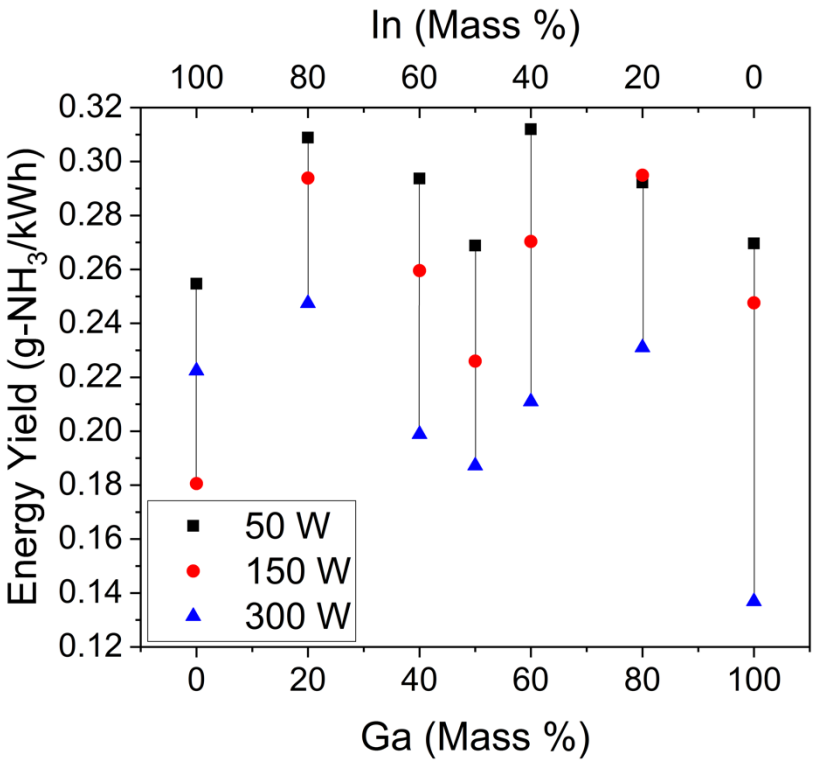

Figure S11. Energy Yield (g-NH3/kWh) vs. Composition of Alloy (mass%) for various plasma powers

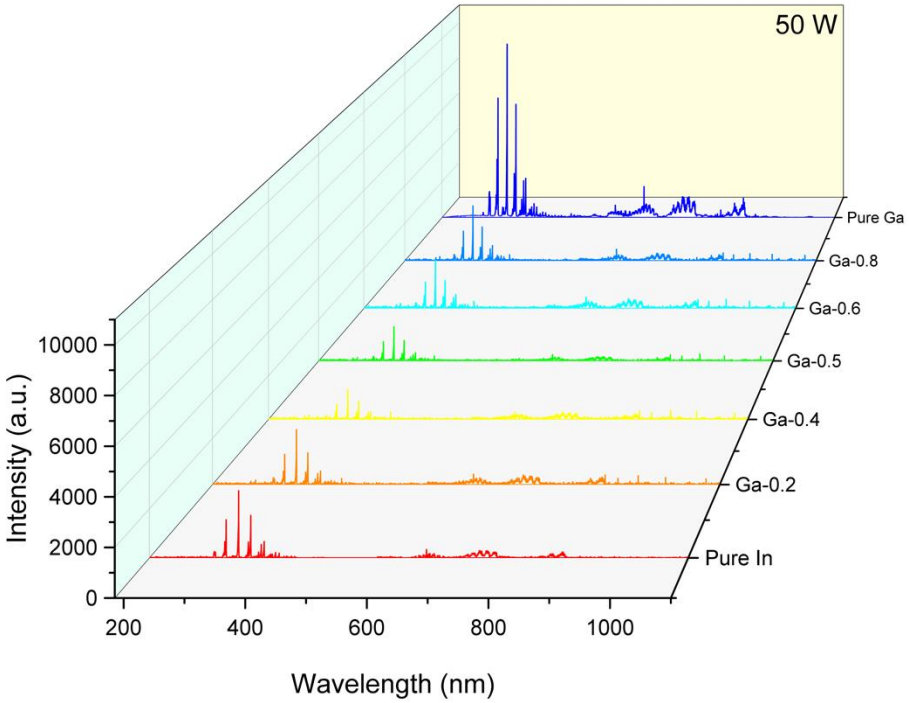

Figure 12. Emission spectra of plasma using various catalysts at 50 W plasma power

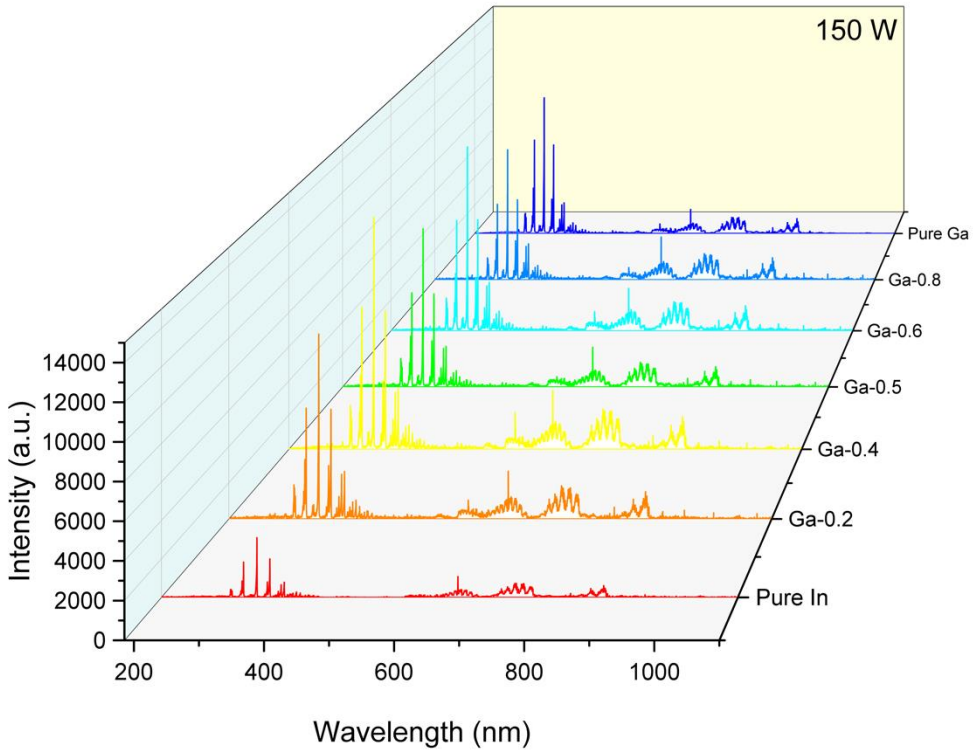

Figure S13. Emission spectra of plasma using various catalysts at 150 W plasma power

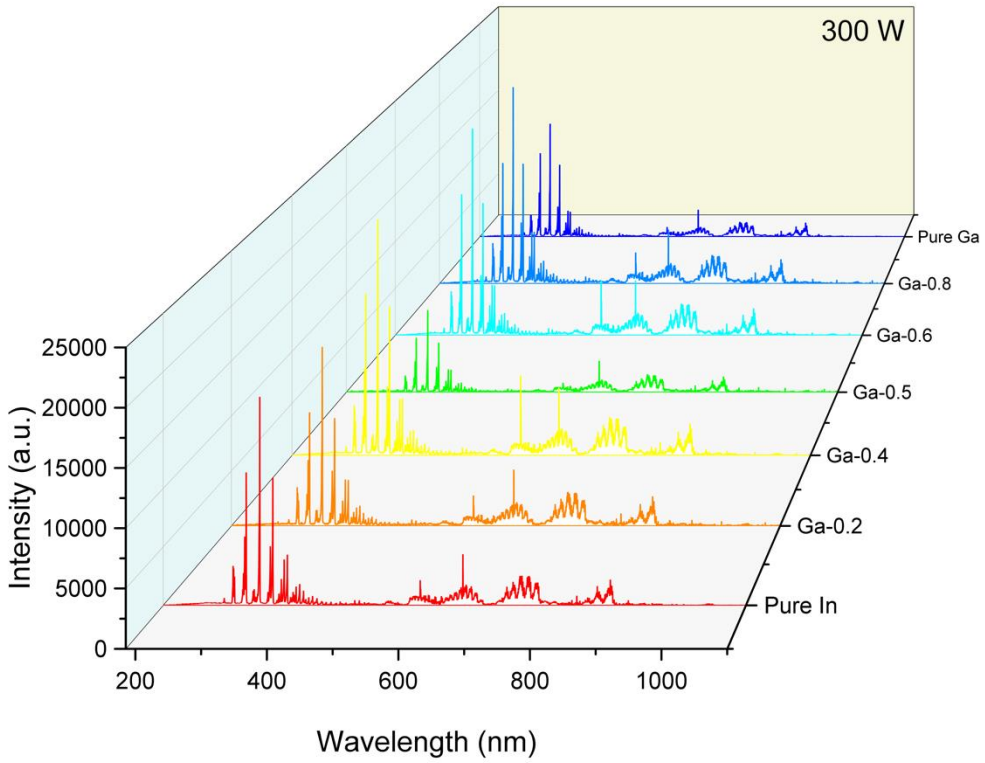

Figure S14. Emission spectra of plasma usuing various catalysts at 300 W plasma power

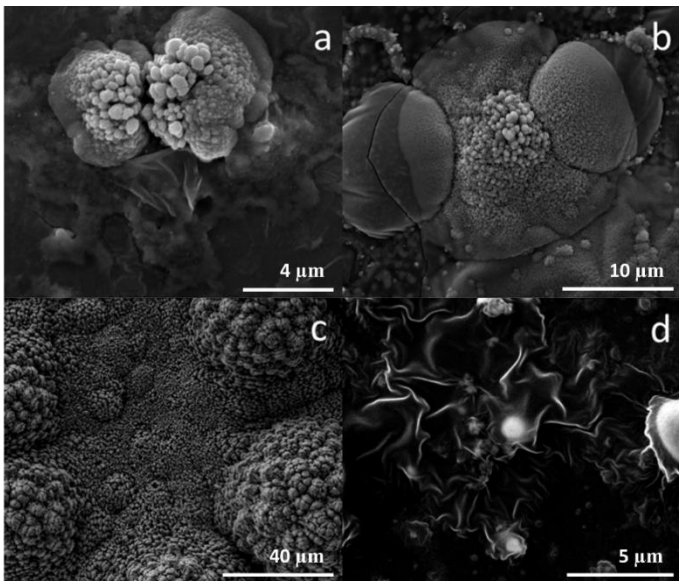

Figure S15. Formation of GaN (plasma treatment time) a) Starting of Nucleation Process (5 min) b) Dissolution of Nitrogen in the Gallium Droplet (15 min) c) Durain-like GaN Nanostructures (30 min) d) Nanowires of GaN getting generated from a single droplet (120 min)

References

1. Calculated Ga-In phase diagram. Availabe online: http://resource.npl.co.uk/mtdata/phdiagrams/gain.htm (accessed on August, 2018).