

Electronic Supporting Information

Titanium Nitride as an Alternative and Reusable Plasmonic Substrate for Fluorescence Coupling

Prabhat Mishra^{a,d}, Anil K. Debnath^{b,d}, and Sharmistha Dutta Choudhury^{c,d,*}

^aMaterials Processing & Corrosion Engineering Division, Bhabha Atomic Research Centre, Mumbai
400 085, India.

^bTechnical Physics Division, Bhabha Atomic Research Centre, Mumbai 400 085, India.

^cRadiation & Photochemistry Division, Bhabha Atomic Research Centre, Mumbai 400 085, India.

^dHomi Bhabha National Institute, Training School Complex, Anushaktinagar, Mumbai 400094,
India.

Corresponding Author

*E-mail: sharmidc@barc.gov.in; Telephone: 91-2 2-25595097; Fax: 91-22-25505151

ORCID ID

Sharmistha Dutta Choudhury: 0000-0003-4000-4930

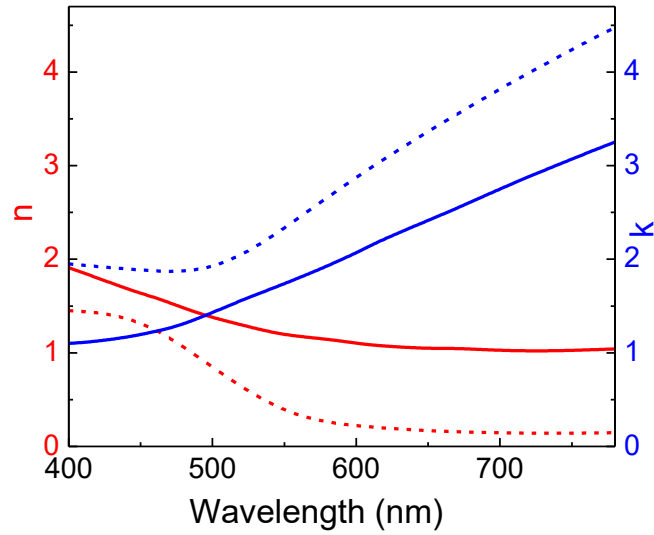


Fig. S1. Variation in the complex refractive index ($n+ik$) of TiN (solid) and Au (dash) with wavelength.^{1,2} The refractive index is related to the complex dielectric permittivity ($\epsilon_r+i\epsilon_{im}$) of the materials as: $\epsilon_r=n^2-k^2$ and $\epsilon_{im}=2nk$.

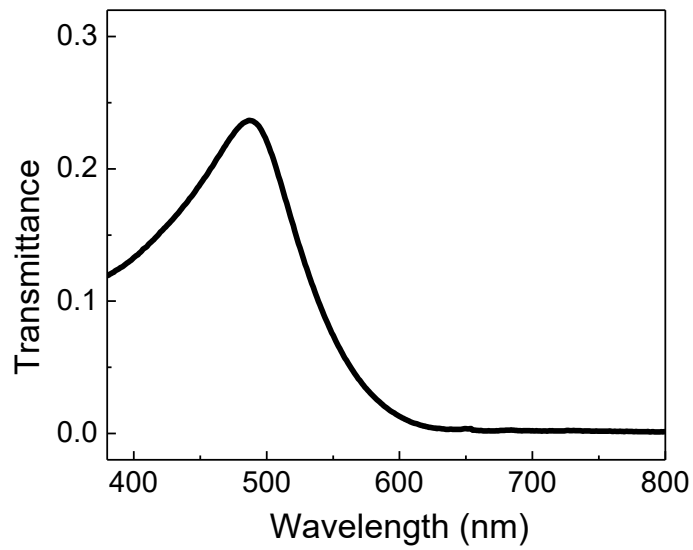


Fig. S2. Transmittance spectrum of Au thin film deposited on glass substrate.

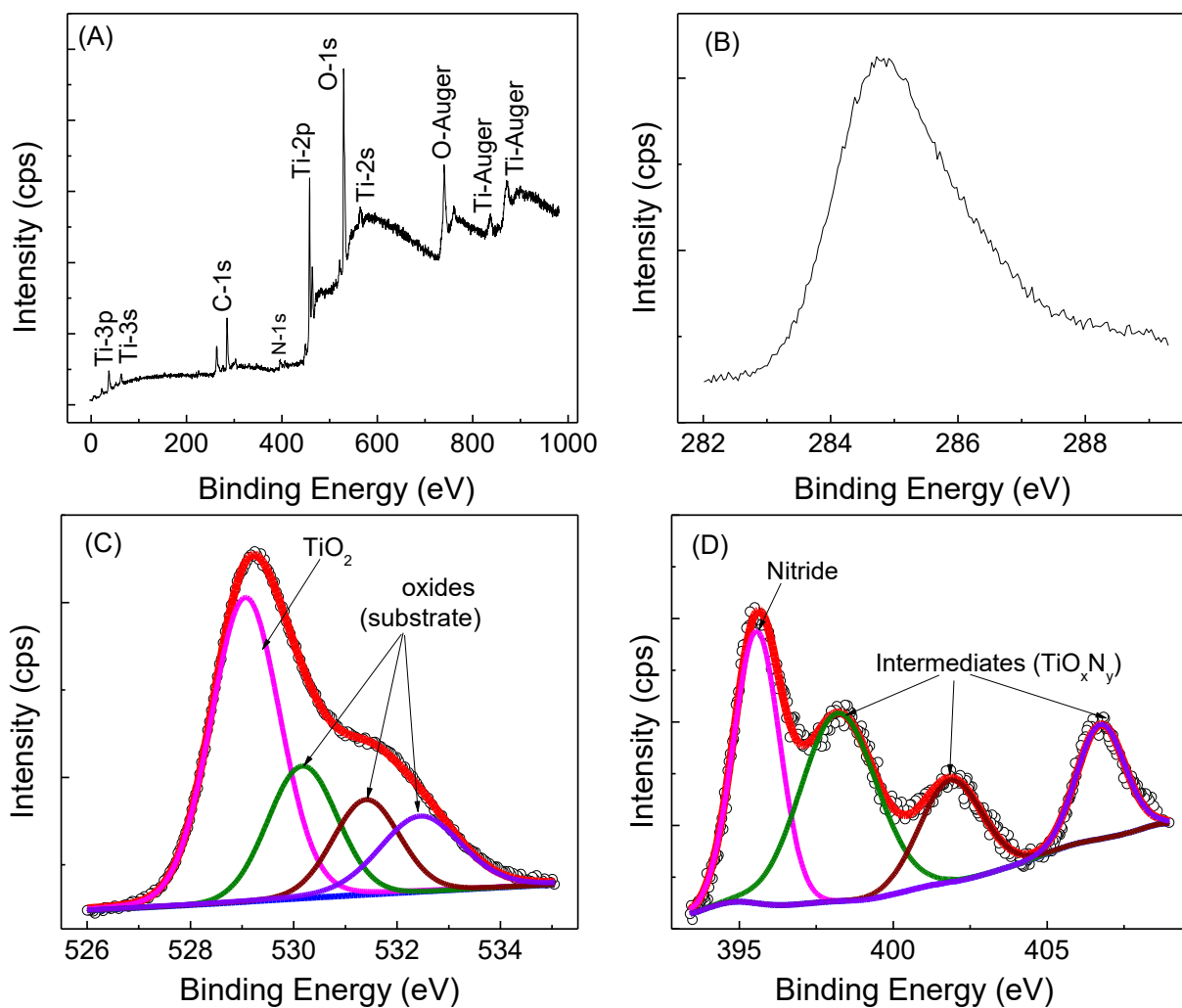


Fig. S3. XPS survey spectrum (A) and core level C 1s (B), O 1s (C) and N 1s (D) spectra of TiN film on glass substrate. The open circles are data points, red line is the fitted curve, and other coloured lines are the deconvoluted peaks for different components.

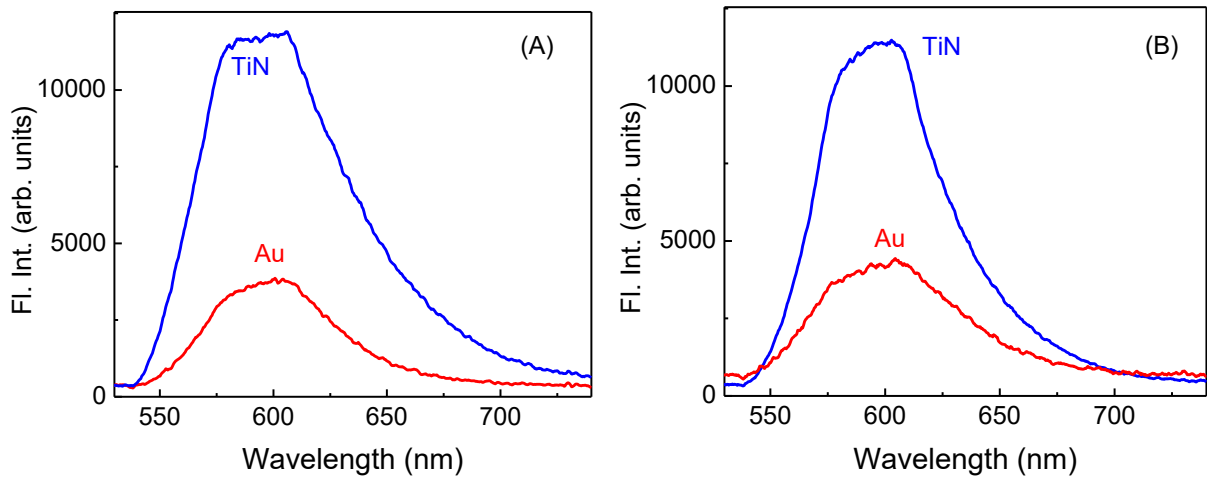


Fig. S4. (A) P-polarized emission spectra of NR coupled with TiN-PMMA (0.5% w/v) and Au-PMMA (0.5% w/v) at 60°. (A) S-polarized emission spectra of NR coupled with TiN-PMMA (1% w/v) and Au-PMMA (1% w/v) at 45°.

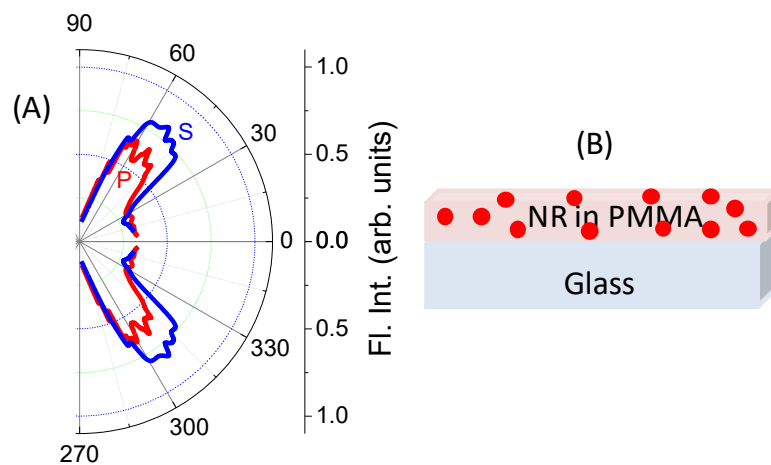


Fig. S5. (A) Angular emission distribution of NR on glass slide coated with PMMA layer (1% w/v). (B) Schematic of the substrate.

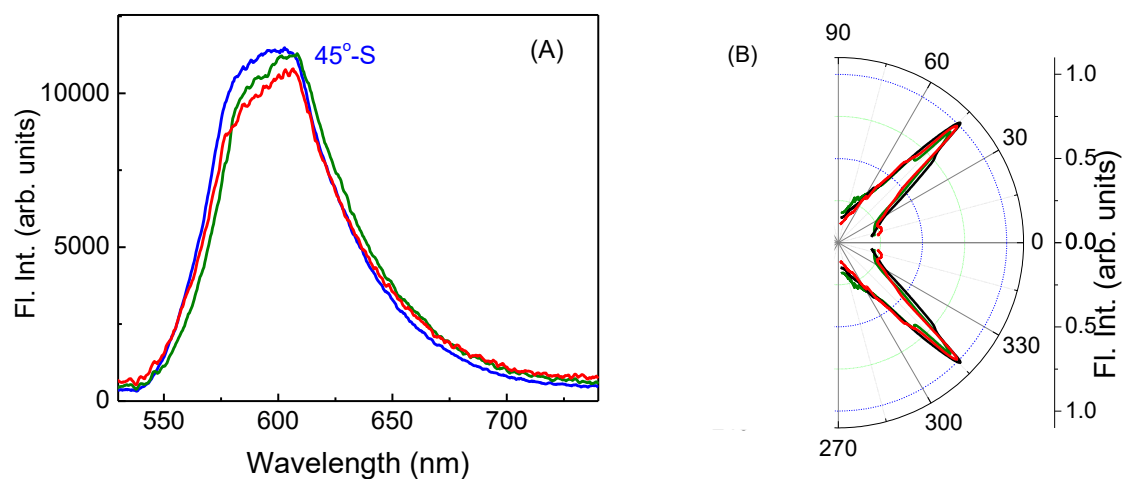


Fig. S6. (A) Superimposed emission spectra of NR coupled with TiN-PMMA (1.0% w/v) substrate reused for three repeated measurements after washing and recoating with the dye layer. (B) Superimposed angular emission distributions of NR on TiN-PMMA (1.0% w/v) substrate reused for three repeated measurements.

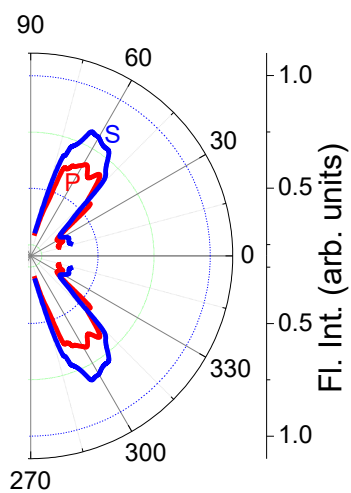


Fig. S7. Angular emission distribution of TMPyP on glass slide coated with PVA layer (5% w/v).

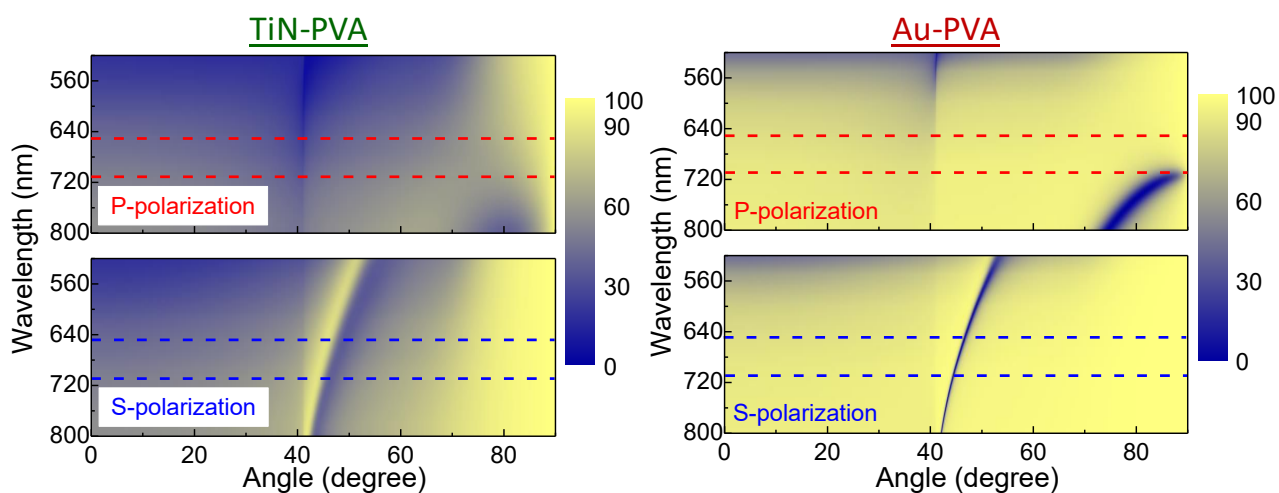


Fig. S8. Calculated reflectivity dispersion diagrams for TiN-PVA and Au-PVA substrates with PVA layer thickness of 175 nm. The emission maxima of TMPyP are indicated by dashed lines.

References

1. P. Patsalas, N. Kalfagiannis and S. Kassavetis, Optical Properties and Plasmonic Performance of Titanium Nitride, *Materials*, 2015, **8**, 3128–3154.
2. *CRC Handbook of Chemistry and Physics*, 89 edn., Taylor & Francis Group, Boca Raton, 2008.