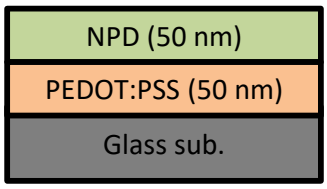
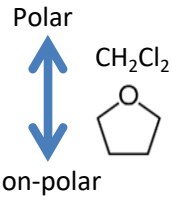
Property evaluation of OLED layers in Solution process and Vacuum deposition process

We compared film properties of OLED layers deposited by solution process and vacuum deposition process in spectroscopic ellipsometry and X-Ray reflectivity (XRR). We revealed the difference of optical properties, such as refractive index, surface layer on vacuum deposited sample.



NPD deposition process
- Spin-coating with THF solvent
- Vacuum deposition

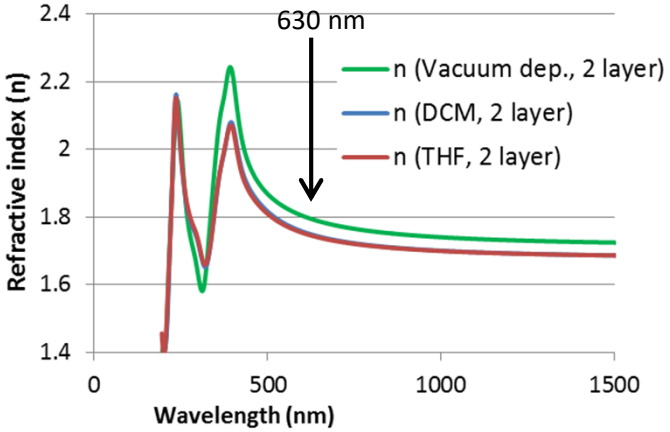


DCM (dicholoromethane)

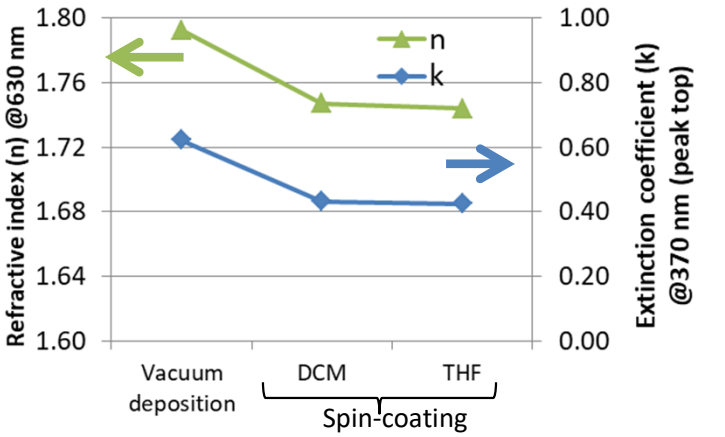
THF (tetrahydrofuran)

Spectroscopic Ellipsometry

Refractive index of NPD layer



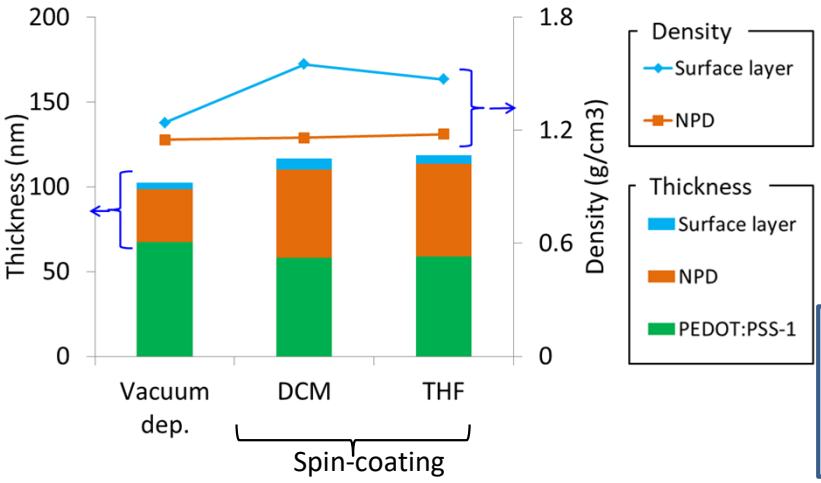
Comparison of refractive index and extinction coefficient



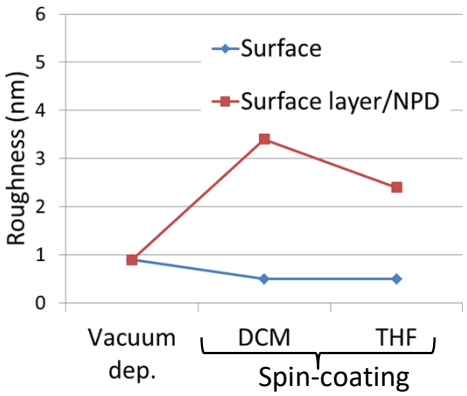
Refractive index and extinction coefficient
: vacuum deposition > spin-coating
→Difference in density or polarizability

X-ray reflectivity analysis (XRR)

Layer thickness, density of each layer

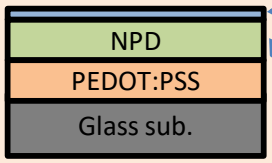


Roughness



- Density of NPD: No significant difference
  → Lower polarizability caused lower refractive index.
- Spin-coating sample: surface layer with higher density.
- Difference of roughness on surface layer / NPD interface

Features of "spin-coating" in comparison to "vacuum deposition"



Surface layer with higher density
Higher roughness on surface layer / NPD

Lower refractive index
Lower extinction coefficient
No significant difference on density
→Difference of polarizability

- Difference of optical property, density, roughness on interface were observed.
  →XRR: Fitting is applicable for multilayer.
- GCIB-TOF-SIMS observed solvent residue, impurity on surface and interface as shown in another document.
  → Integrated analysis by combination of techniques

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