Structure of Pentacene films on polymer dielectric

Beamline: X21

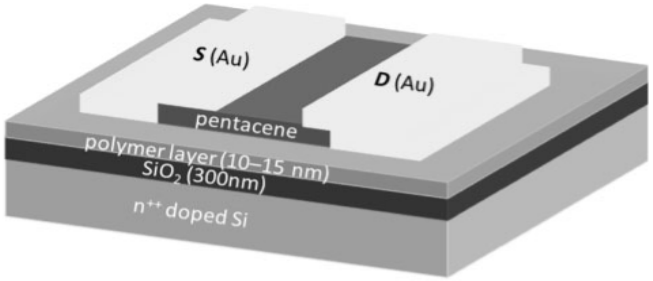
Category of Researcher:
GU/NSLS collaboration

Technique: GIXD

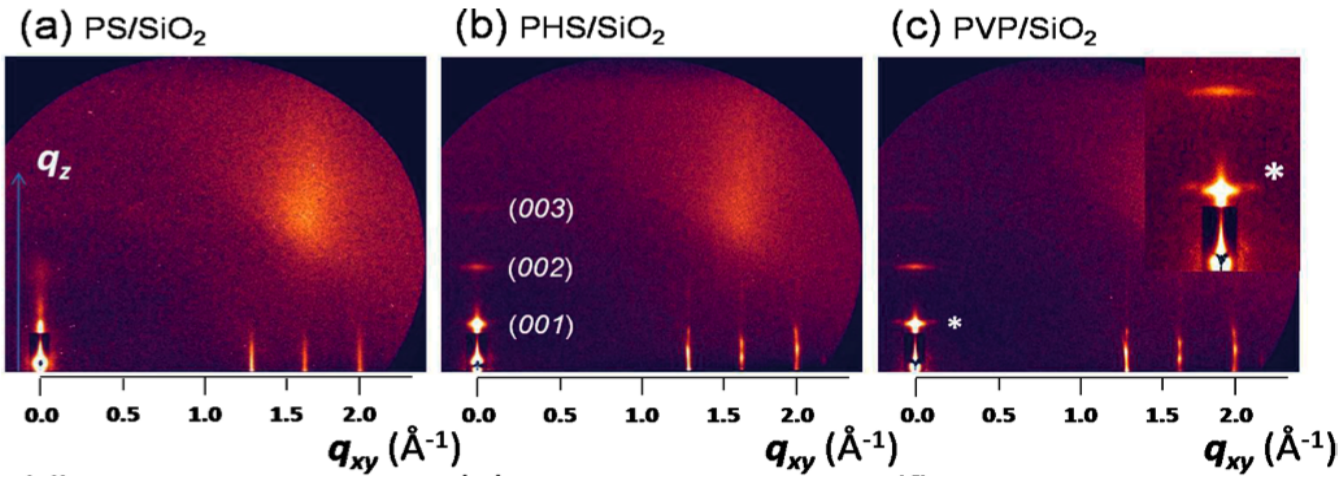
Researchers & Affiliations:
H Yang (RPI),
L Yang (BNL),
SH Kim, SY Yang, CE Park (POSTECH, Korea).

Publications:
"Pentacene Nanostructures on Surface-Hydrophobicity-Controlled Polymer/SiO_2 Bilayer Gate-Dielectrics" Advanced Materials, 19: 2868, 2007

Motivation: The performance of Organic Thin Film Transistors (OTFTs) critically depends on molecular packing within the material. X-ray scattering helps to clarify how the structure of the film depends on the device production process.



Polymer/SiO_2 gate-dielectric	Surface energy (mJ cm^{-2})	Mobility (μ, $cm^2V^{-1}s^{-1}$)
PS/SiO_2	44.19	0.91±0.03
PHS/SiO_2	49.81	0.46±0.05
PVP/SiO_2	57.59	0.34±0.06



Results: Different polymer dielectric layer resulted in different molecular packing of pentacene molecules on the polymer layer. The PS layer has the lowest surface energy and produces best molecular packing and best device performance.