

# On the Morphology of PCPDTBT:PC<sub>71</sub>BM Thin Blend Films for Organic Photovoltaics

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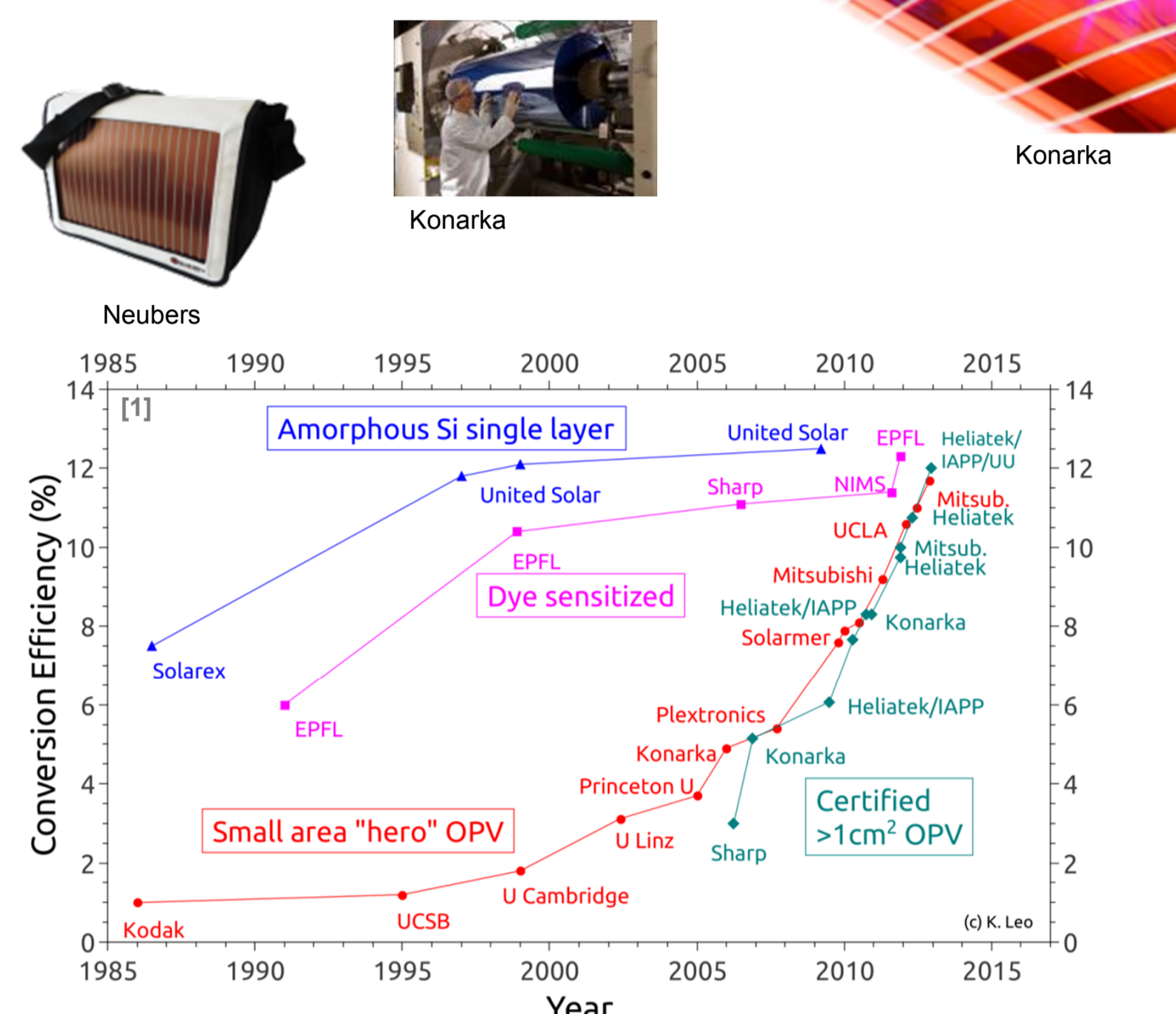
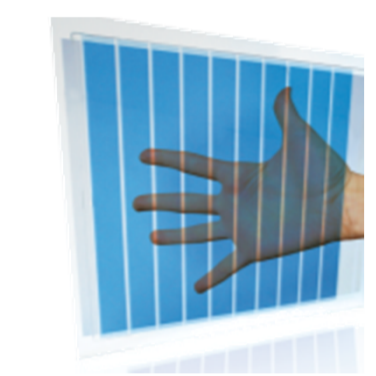
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## motivation & introduction

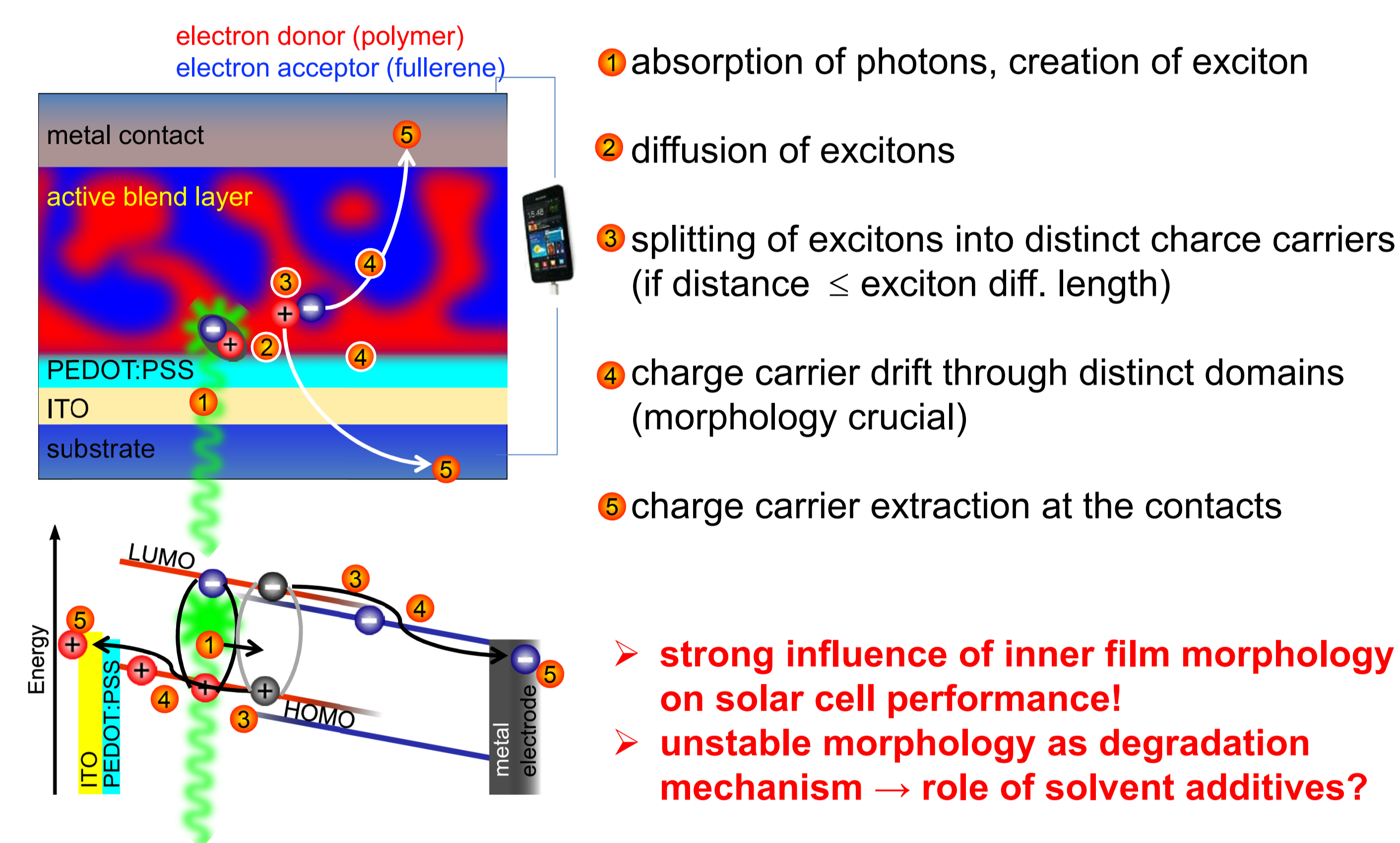
why Polymer Solar Cells?



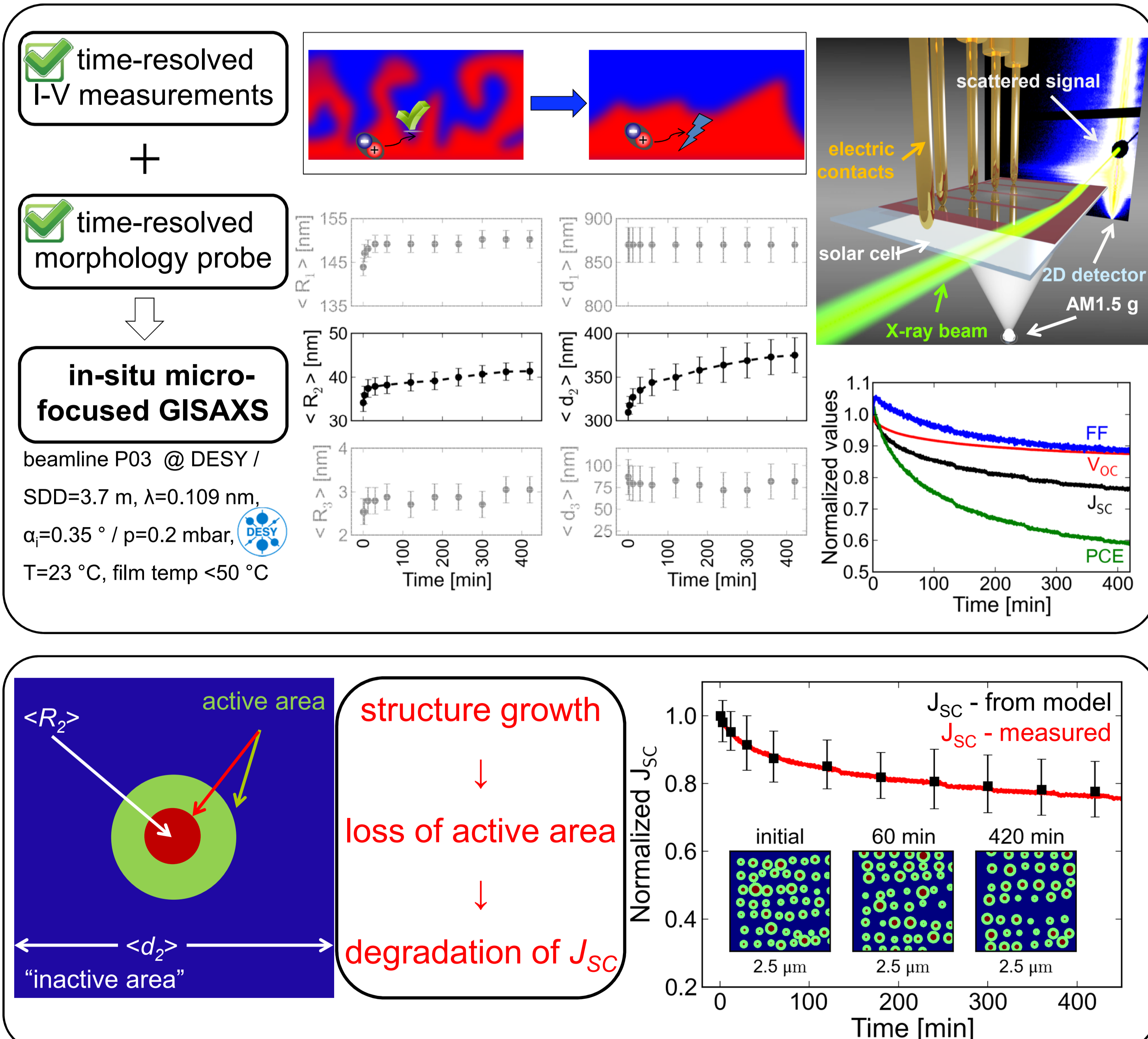
- mechanical flexibility
- low production cost
- availability of materials
- non-toxic
- large scale applicability
- design and shape
- efficiencies exceed 10%



## working principle and morphological degradation



## morphological degradation in P3HT:PCBM solar cells<sup>[2]</sup>:

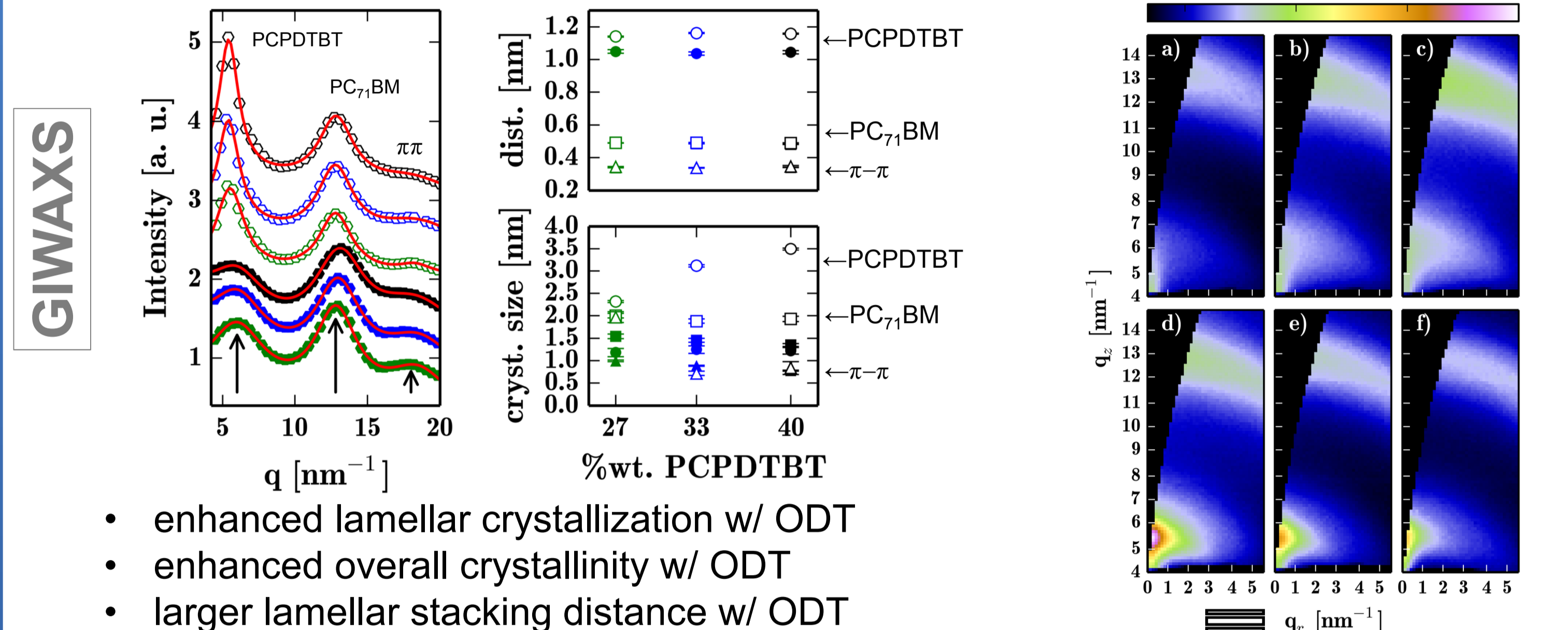


aim: morphological degradation in PCPDTBT:PC<sub>71</sub>BM?  
→ understand morphology first

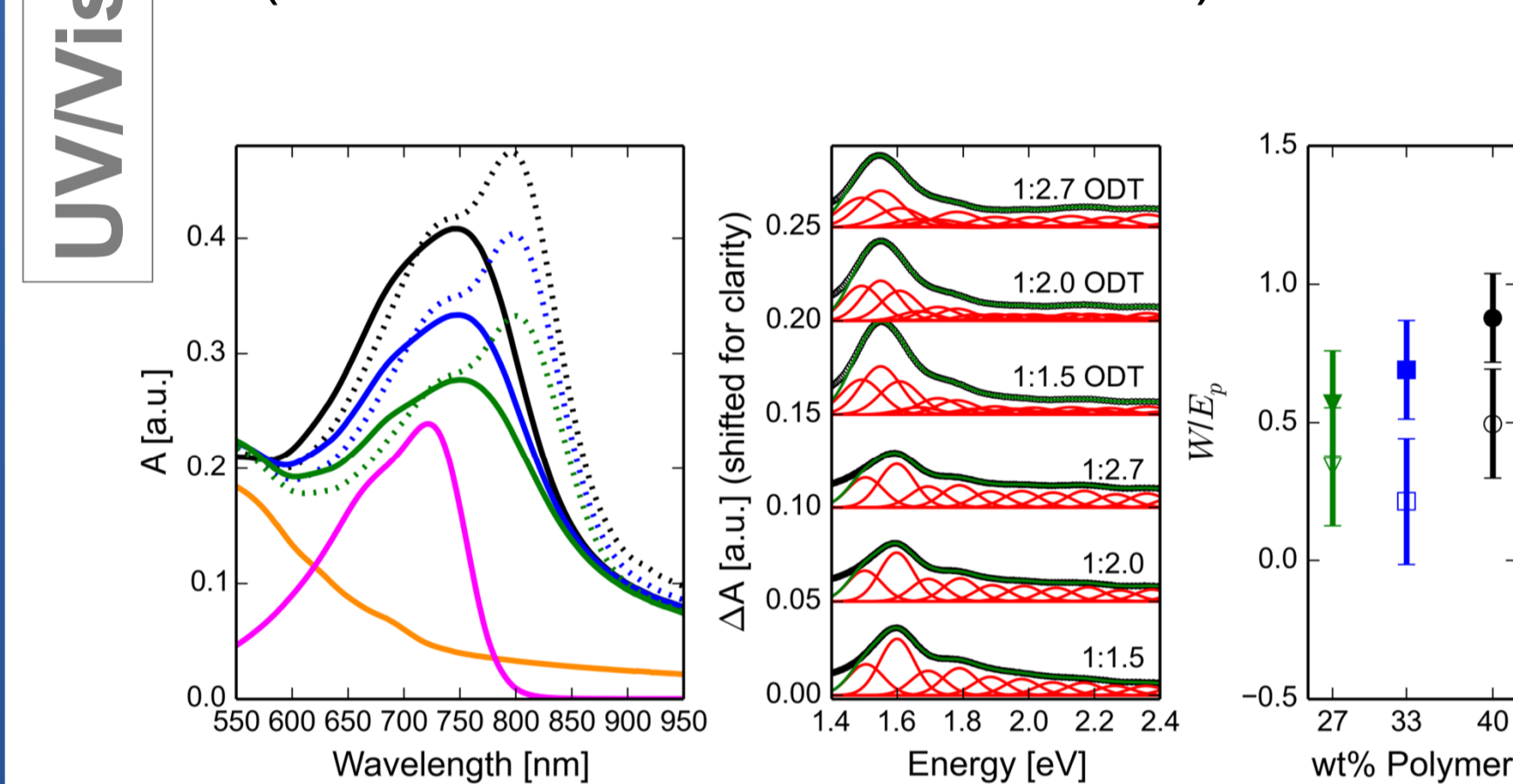
## PCPDTBT:PC<sub>71</sub>BM morphology<sup>[3]</sup>

- probe different blend ratios (1:1.5, 1:2.0, 1:2.7)
- probe influence of ODT (3%vol. in CB (○), w/o ODT (●))

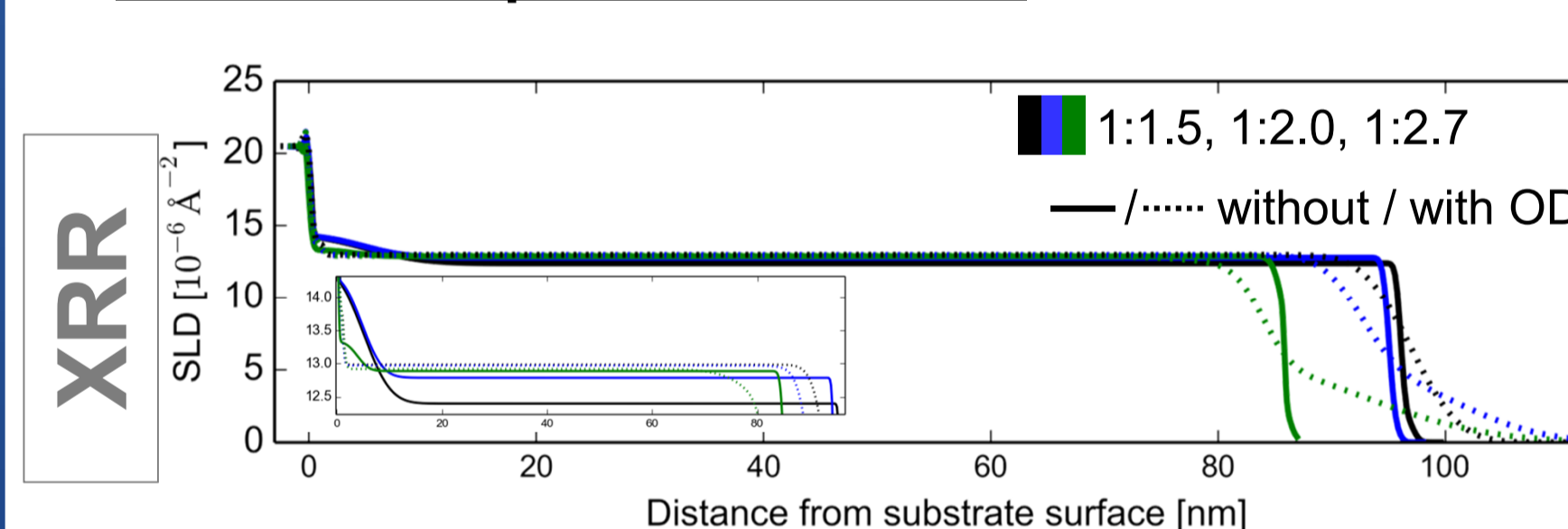
### crystalline structure:



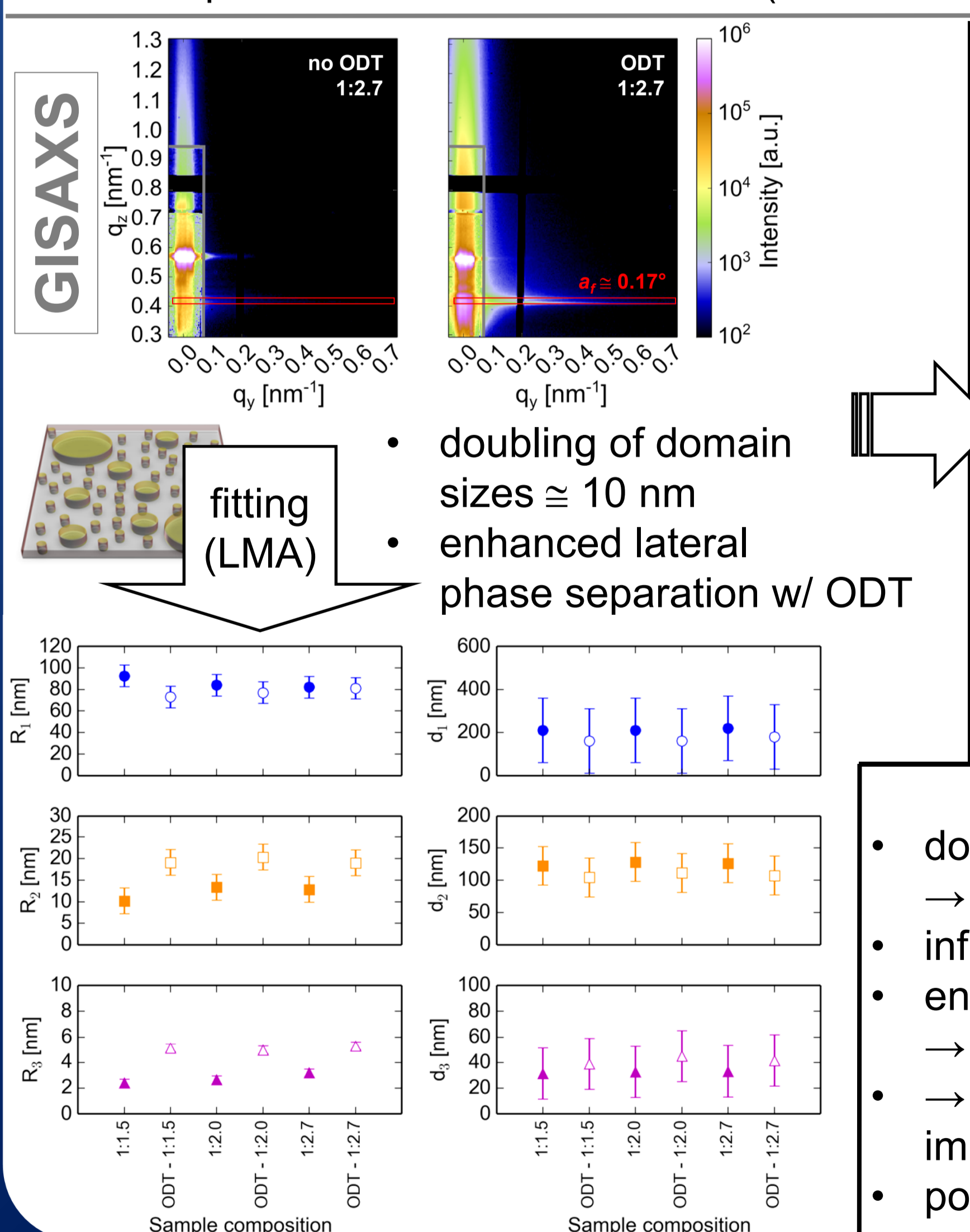
- improved order w/ ODT (→ smaller exciton bandwidth  $W$ )



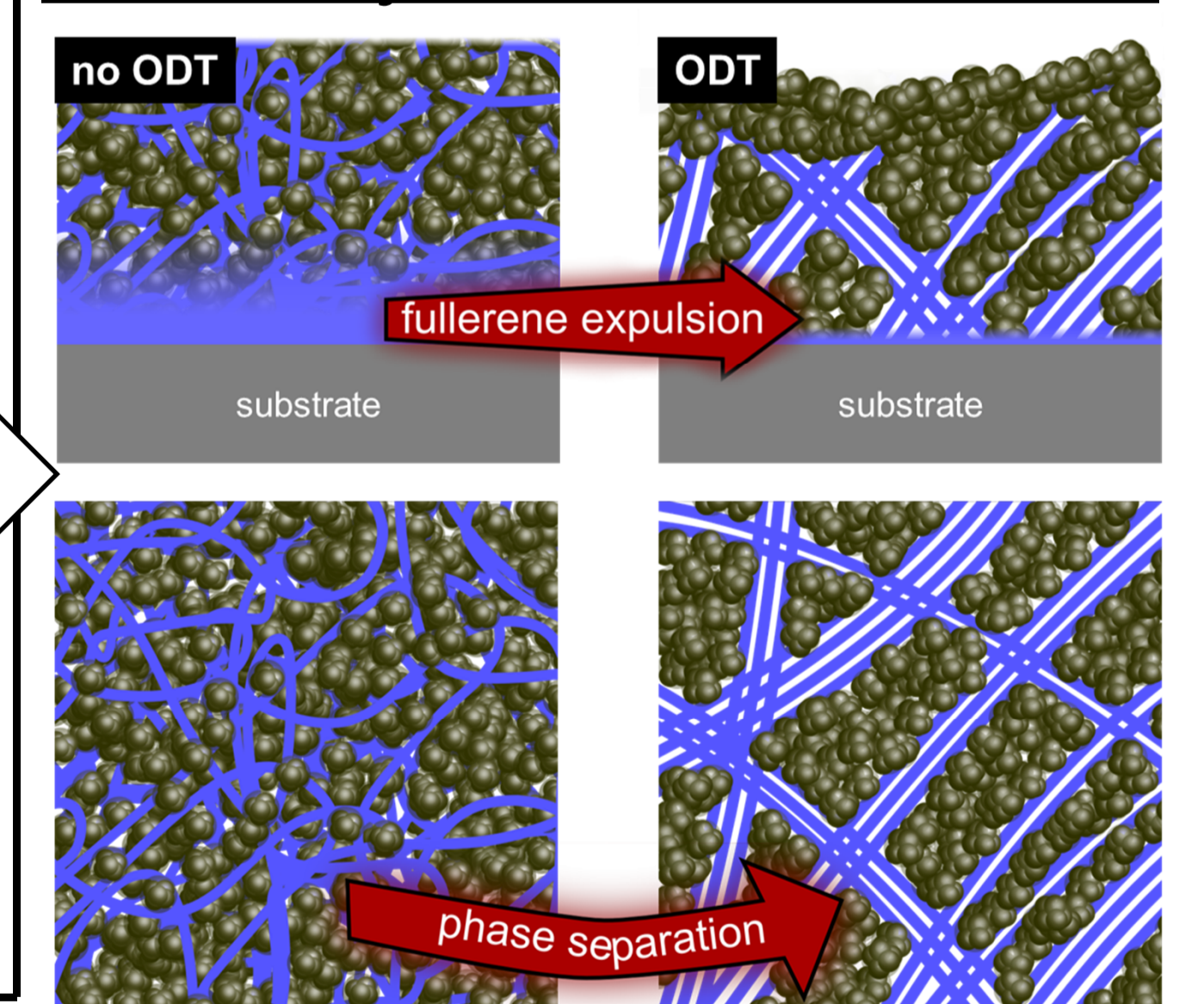
### mesoscopic structure



- blend layer SLD independent from blend ratio w/ ODT, higher film density w/ ODT
- expulsion of fullerene to surface (see Guerrero et al. <sup>[4]</sup>)



### summary: influence of ODT



- domain purification, enhanced crystallization → improved absorption
- influence of blend composition suppressed
- enhanced lateral & vertical phase separation → "built-in" electron blocking layer → less bimolecular recombination, improved percolation
- possibly not long term stable (by UV/Vis, PL)

## Outlook

- investigate morphological stability
- verify with other systems / solvent additives
- suppression of morphological transitions by use of appropriate polymer design (e.g. cross-linkable polymers or block copolymers)

References: [1] [www.orgworld.de](http://www.orgworld.de) (2014)