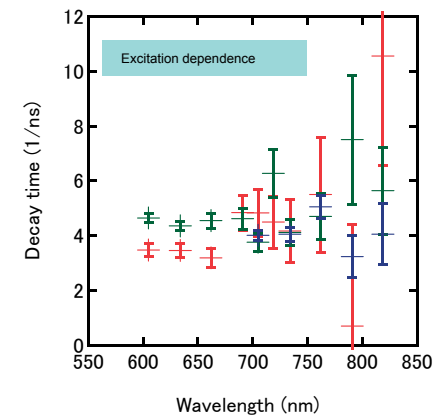
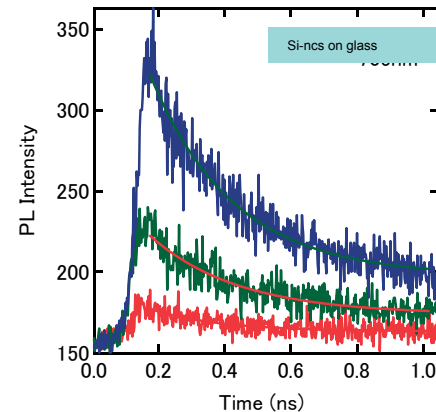
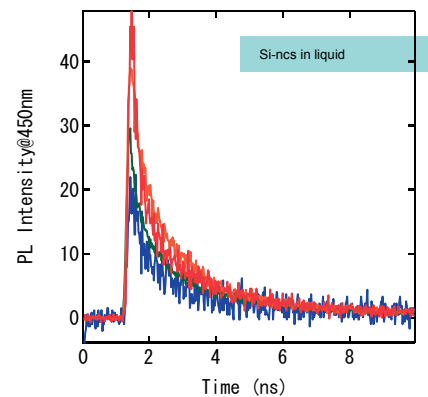
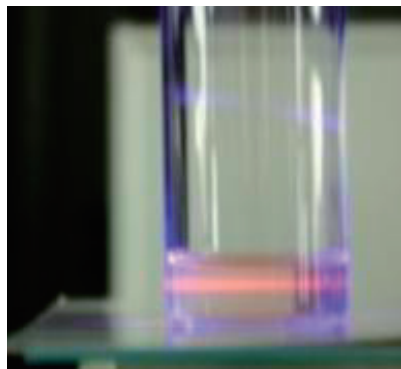


Hybrid solar cells based on silicon nanocrystals

V. Švrček¹, D. Mariotti^{2,1}, I. Turkevych¹, T. Yamanari³, Y. Shibata³, K. Hara³, T. Tayagaki⁴, M. Kondo¹

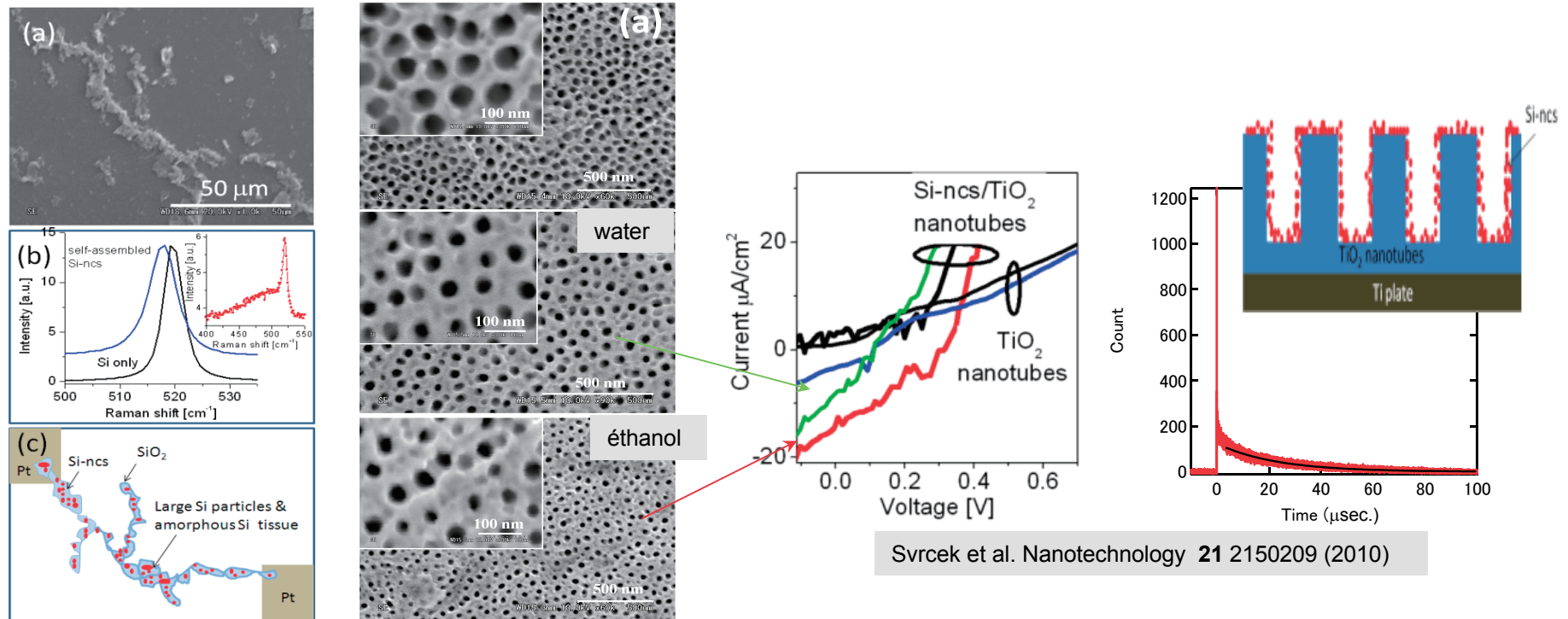
¹Novel Silicon team RCPV, ²Nanotechnology & Advanced Materials Research Institute (NAMRI), University of Ulster, UK, ³Organic PV team RCPV ⁴Kyoto University

MEG in colloidal Si-ncs with quantum confinement effect



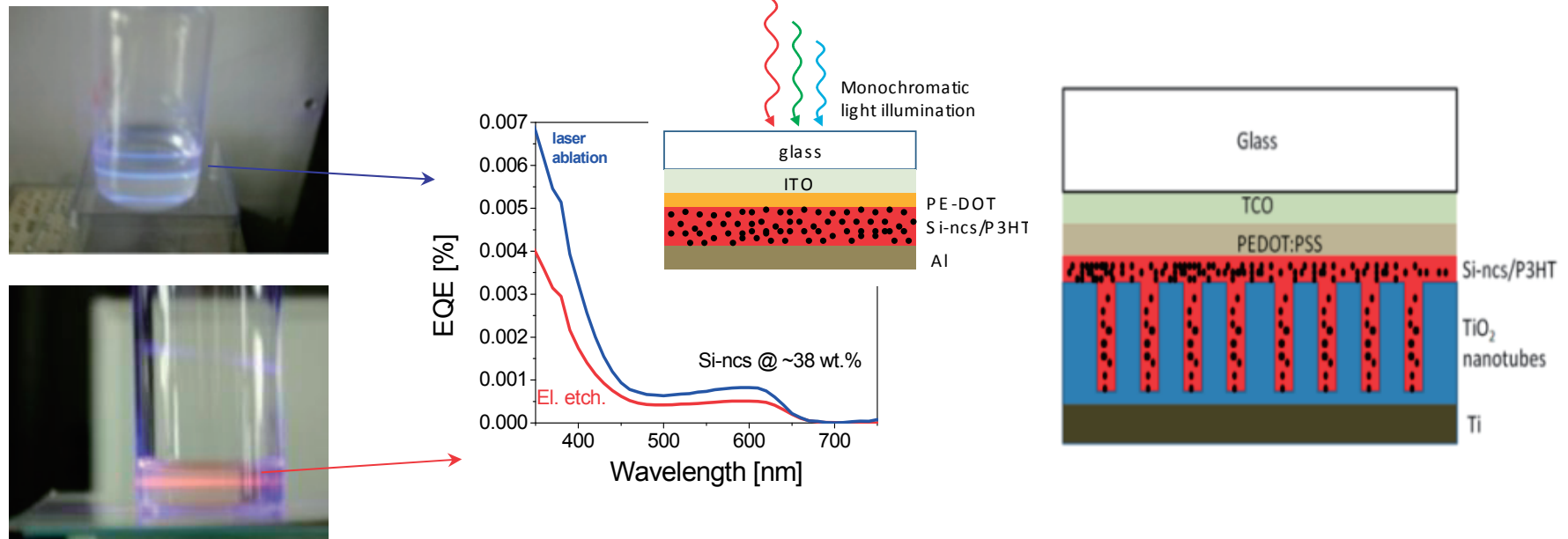
- ★ Solar cell efficiency enhancement by multiple exciton generation (MEG) in Si-ncs
In liquid → laser light scatter & light generation from liquids slow PL decay
- ★ On glass → fast decay however not clear dependence on excitation
no clear evidence of MEG (fast single carrier trapping?)

Evidencing of MEG optoelectrically by self-assembly of Si-ncs and alignment in nanotubes



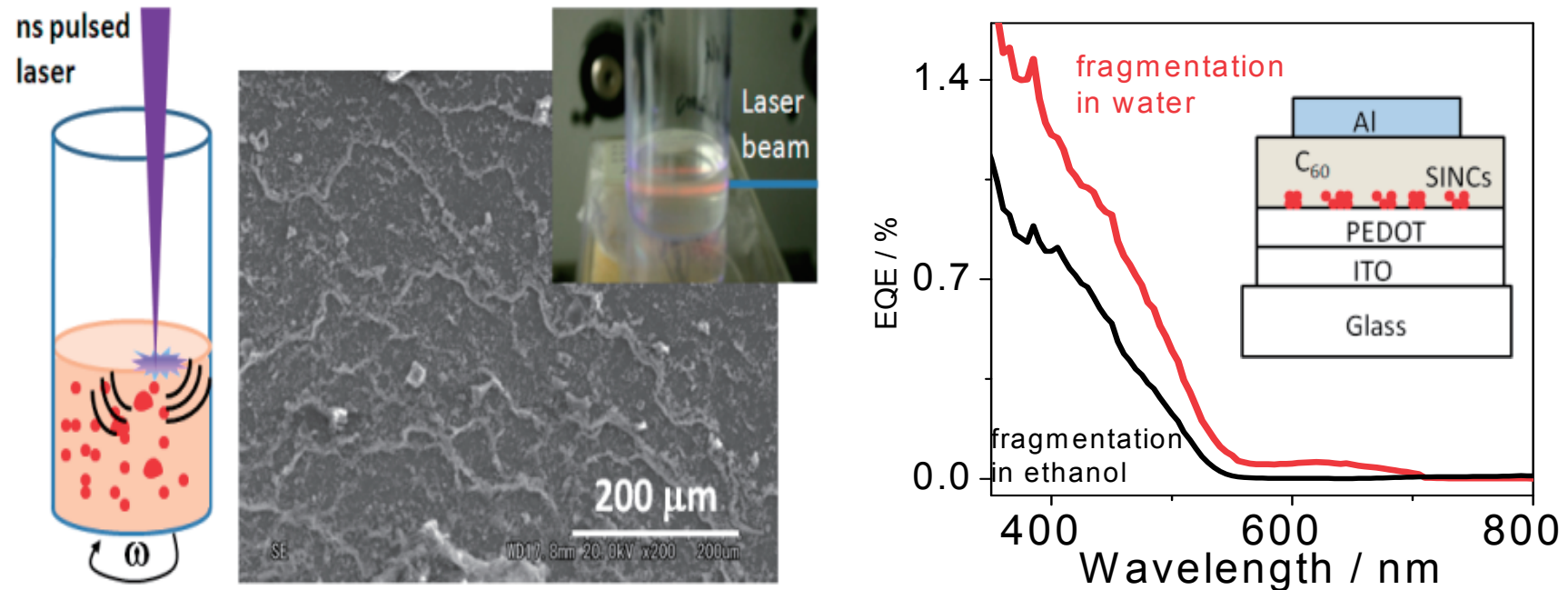
- ★ Self assembly of Si-ncs by laser fragmentation in water → improved transport
Svrcek et al. Chem. Phys. Lett 478 224 (2009)
- ★ Photovoltaic effect of Si-ncs filled into TiO₂ nanotubes.
- ★ Observation of fast PL decay component in Si-ncs/TiO₂ nanotubes composite
Indication of MEG ???

Evidencing MEG through an Si-ncs/polymer bulk-heterojunction (B-H) formation



- ★ MEG hindered by polymer matrix however exciton transfer from P3HT polymer to Si-ncs observed,
- ★ Enhanced B-H surface area improved EQE for blue smaller-sized Si-ncs blended with lamella-like P3HT polymer. Svrcek et al Acta Materialia 57, 5986 (2009).
- ★ Si-ncs/P3HT B-H ordering in TiO₂ nanotubes. Svrcek et al.Nano. Res. Lett., 4 1389 (2009)..

Si-ncs/nanocarbon heterojunction composites



- ★ Si-ncs based photoluminescent self-assemblies synthesized by laser fragmentation in water.
- ★ Stable and after fullerenes deposition a heterojunction is formed and photovoltaic effect due to presence Si-ncs is recorded.
- ★ MEG not measured yet