Heating Stability Observation of Binary and Quaternary Blend Organic Photovoltaics via *In Situ* Photoluminescence Spectroscopy

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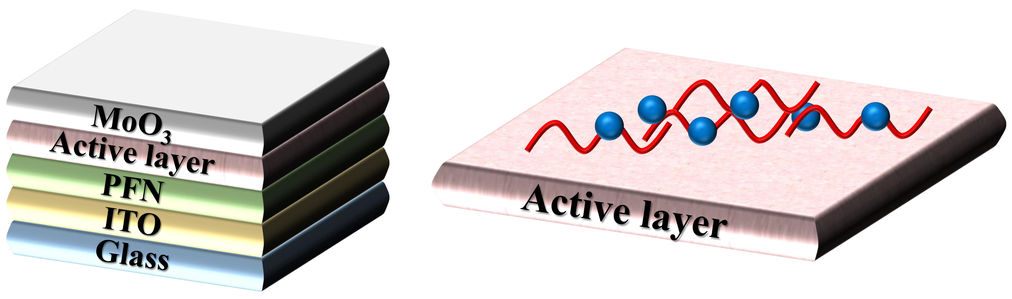
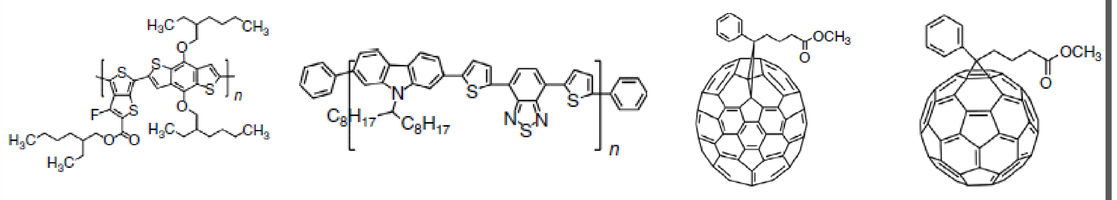
Introduction

OPV (Organic photovoltaics)



: Electron donors : Electron acceptors

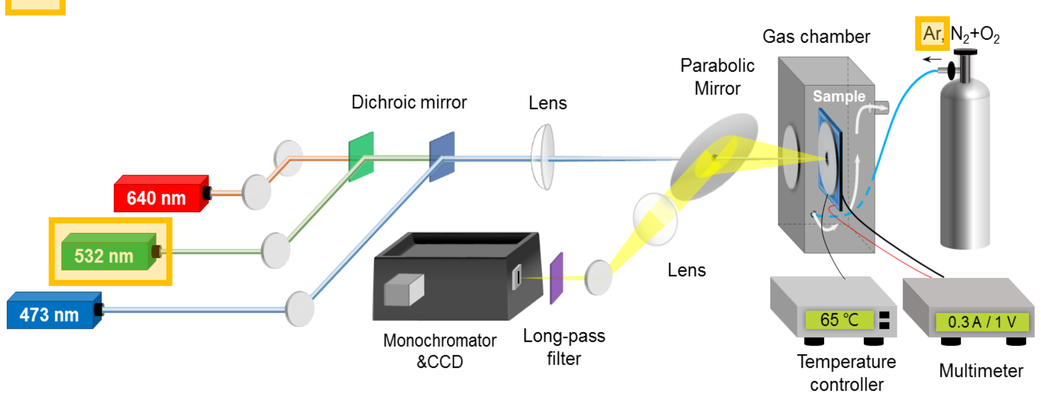
PTB7 **PCDTBT** **$PC_{71}BM$** **$PC_{61}BM$**



Binary blend : PTB7 & $PC_{71}BM$

Quaternary blend : PTB7 & PCDTBT & $PC_{71}BM$ & $PC_{61}BM$

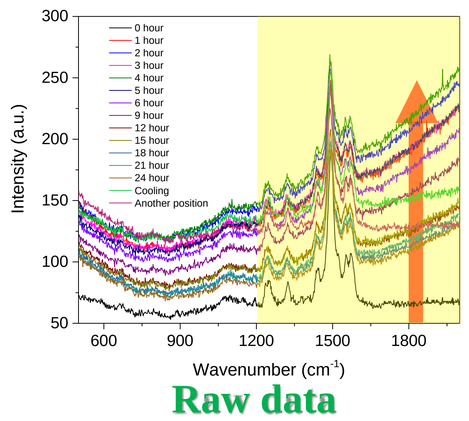
: Measurement condition



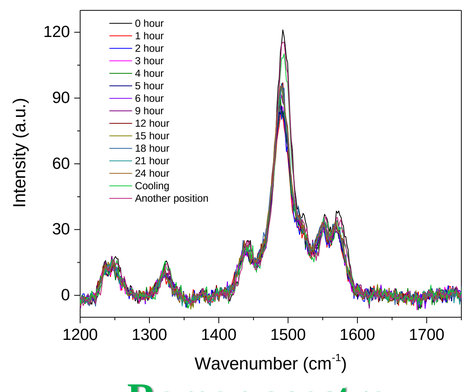
Home-built Raman spectrometer

Result

Binary OPV (b-OPV) Raman spectra at 123 ℃

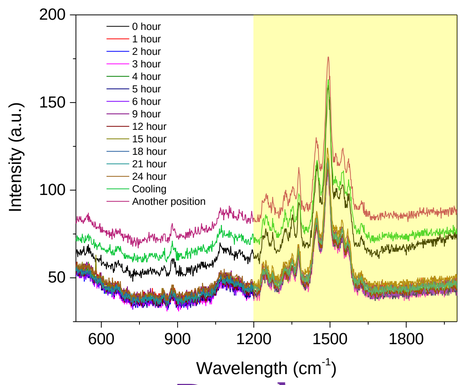


Raw data

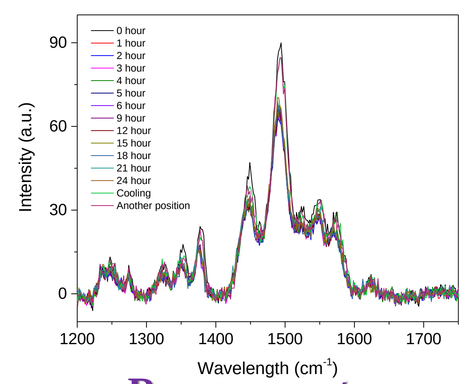


Raman spectra

Quaternary OPV (q-OPV) Raman spectra at 123 ℃



Raw data

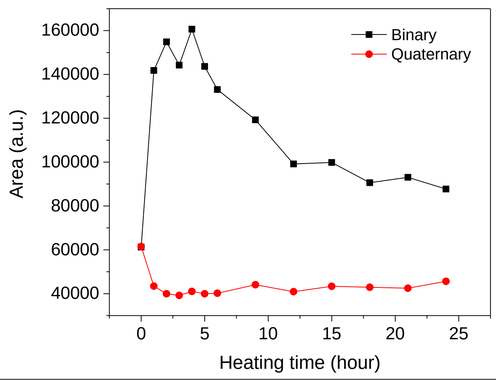


Raman spectra

Quantitative comparison

■ : b-OPV, ● : q-OPV

Raman intensity integral (Integral region : 1200 ~ 2000 cm^{-1}) → Notable difference occurs between b-OPV and Q-OPV.



▣ **Degradation of electron donors was not observed in both Raman spectra of b-OPV and q-OPV.**

▣ **Generation of fluorescence is observed in raw data of b-OPV, but not in those of q-OPV.**

Interpretation & Conclusion

▣ **Fullerene derivatives which are electron acceptors can act as fluorescence quencher. So, generation of fluorescence implies that electron acceptors are not fixed near electron donors, but move freely in active layer.**

▣ **Mobility of electron acceptors is related to morphological state of active layer. Therefore, these spectroscopic data show that morphological stability of q-OPV is higher than that of b-OPV in heating condition.**

Acknowledgement

This work was supported by the Institute for Basic Science (IBS) R023-D1