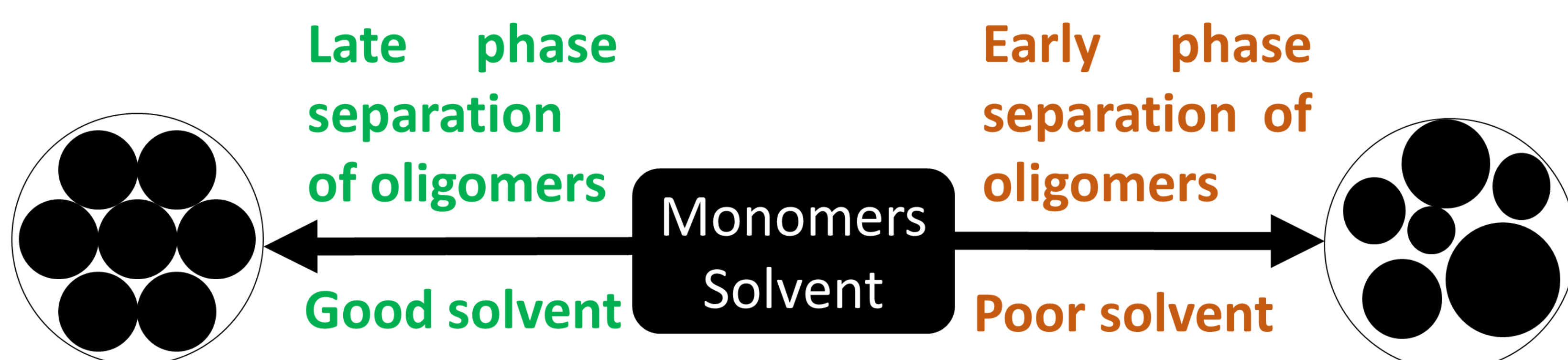


Introduction

Polyimide (PIs) are a class of porous organic polymers (POPs) with excellent physical and chemical properties.¹ PIs have been applied for addressing current energy and environmental challenges such as gas adsorption and separation, electrical energy storage, and heterogeneous catalysis. Here we introduce Hansen Solubility Parameters (HSPs) in the synthesis of PIs to enhance and optimise the surface area and the pore size distributions of PIs.



Formation of uniform pores
High degree of polymerisation
High surface area

Formation of uniform pores
High degree of polymerisation
High surface area

Hansen Solubility Parameters(HSPs)

δ_D Dispersion

δ_P Polarity

δ_H H-bonding

Total solubility parameters

$$\delta_T^2 = \delta_D^2 + \delta_P^2 + \delta_H^2$$

Solvent selection

$$|\Delta\delta_T| = |\delta_{T(\text{solvent})} - \delta_{T(\text{polymer})}|$$

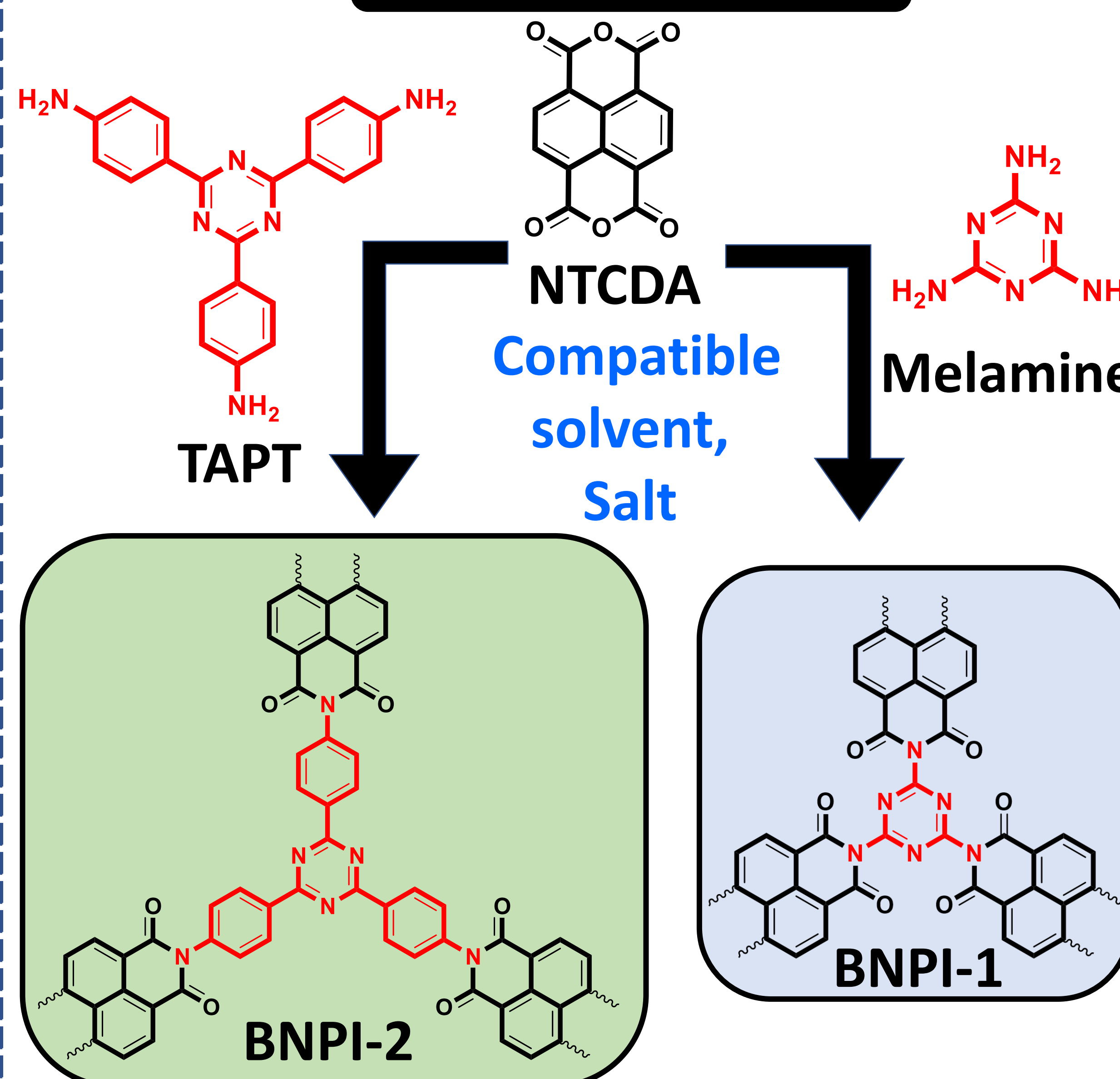
$|\Delta\delta_T| < 1$: good solvent

$|\Delta\delta_T| 1-3$: intermediary solvent

$|\Delta\delta_T| > 3$: poor solvent

Inorganic Salt (LiF, LiI, NaF, NaI, KF, KI) as additives to further tune the HSPs

Synthetic condition

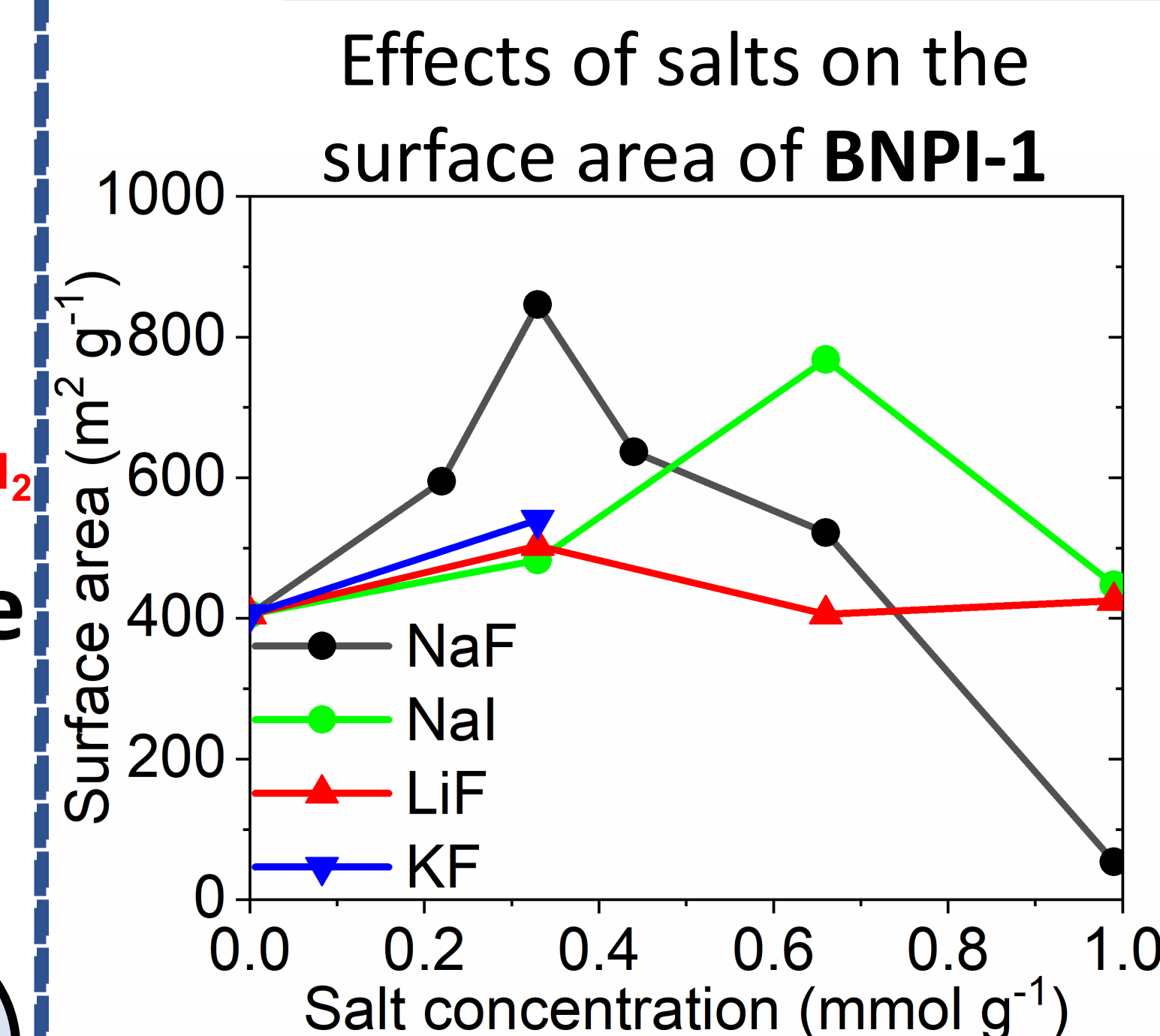
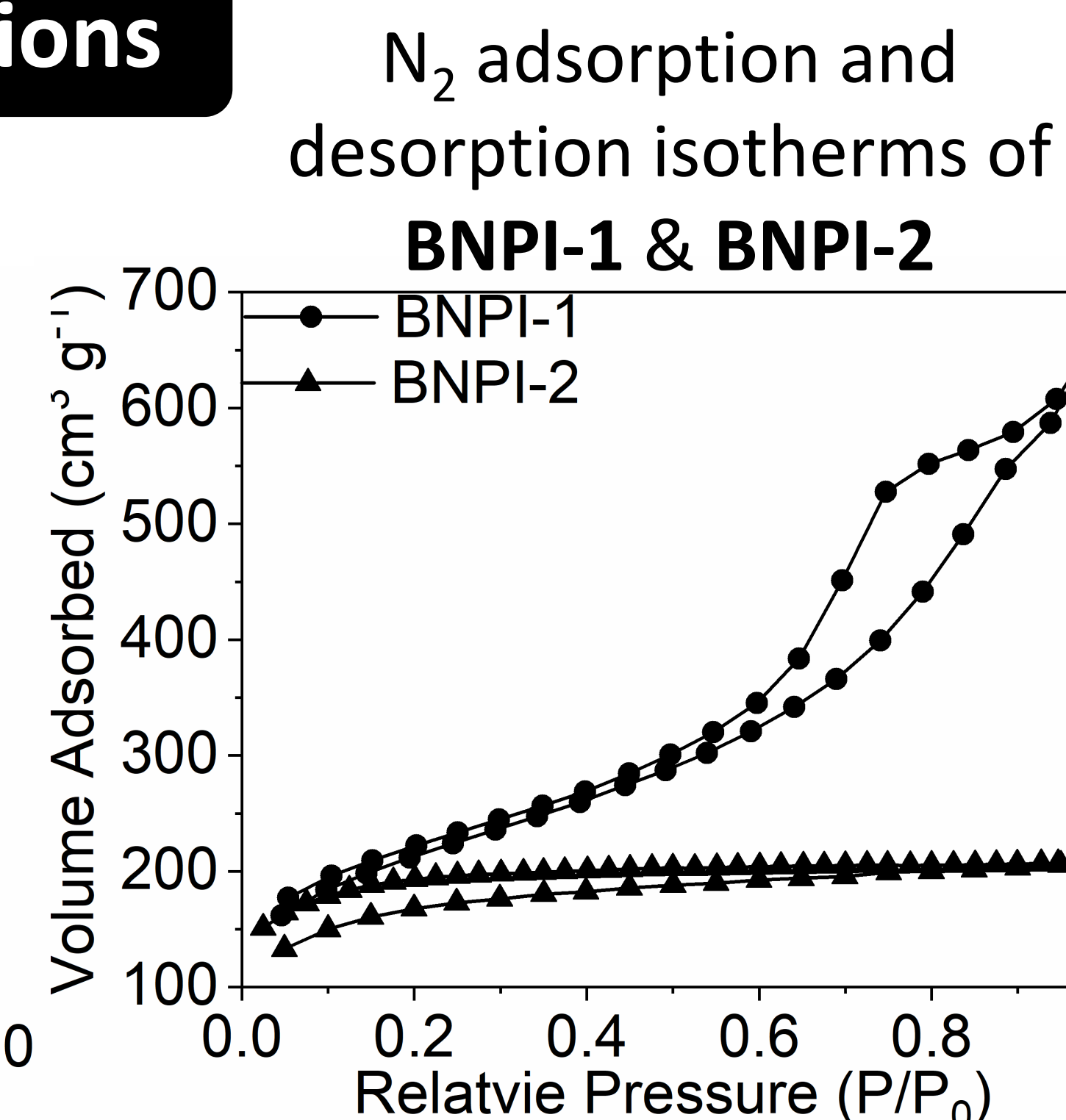
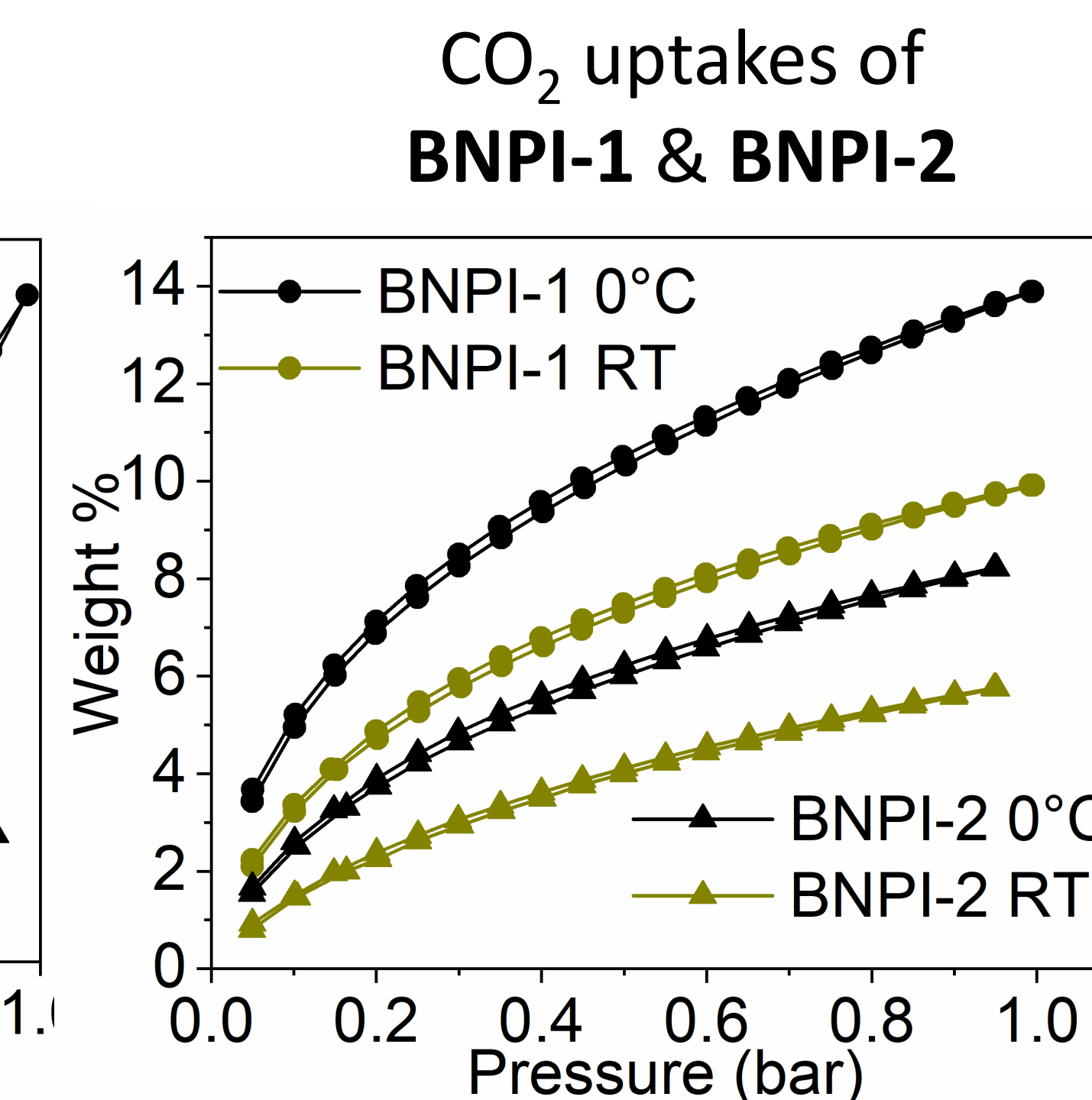
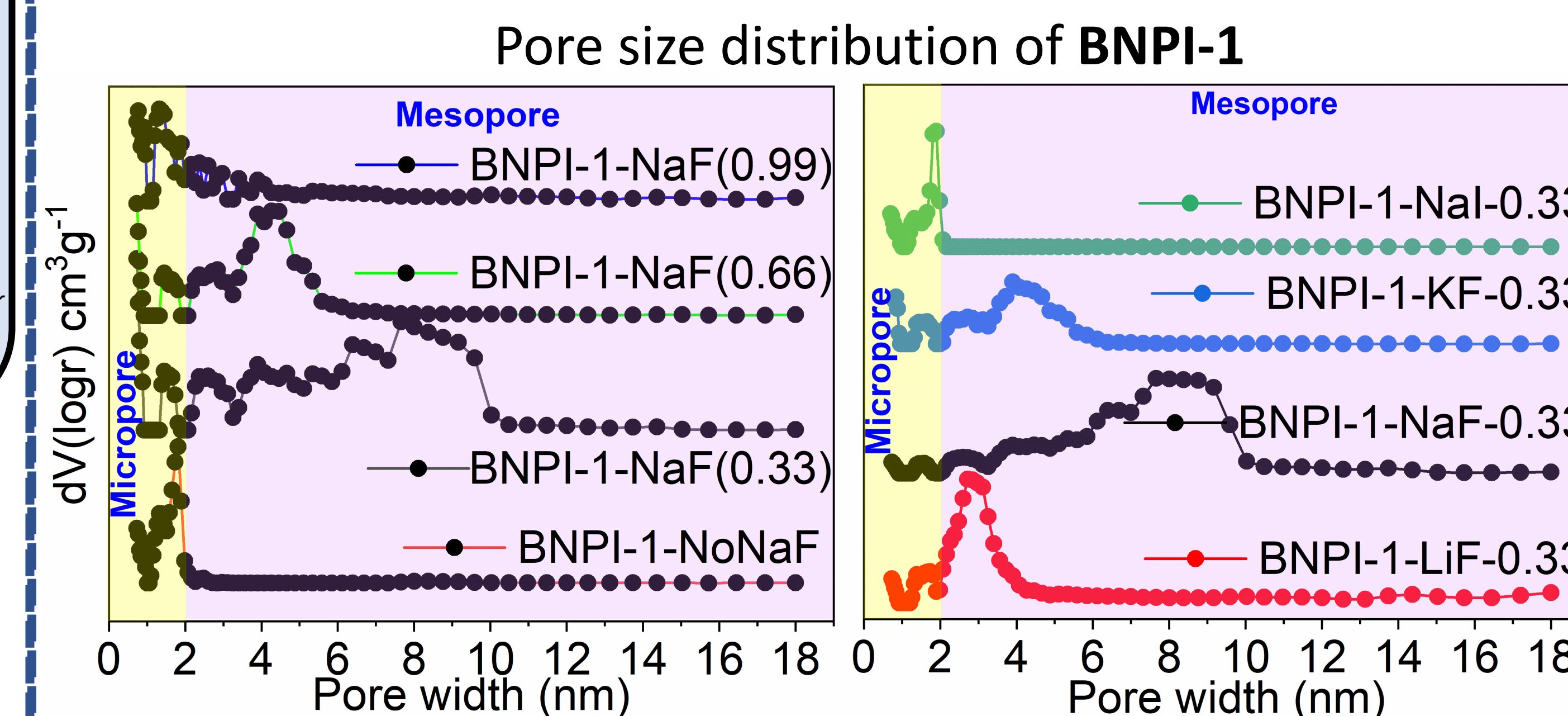


Name	Solvent	Salt	S_{BET} (m ² g ⁻¹)
BNPI-1	Imidazole	--	16
BNPI-1	DMSO	NaF	842
BNPI-2	m-Cresol	--	15
BNPI-2	m-Cresol	NaF	613

HSPs

Name	δ_d	δ_p	δ_h	δ_T
DMSO	18.4	16.4	10.2	26.6
BNPI-1	19.2	16.0	10.2	26.9
m-cresol	18.5	6.5	13.7	23.9
BNPI-2	18.5	6.7	10.2	22.1

Results and discussions



Conclusion

- HSPs, utilizing inorganic salts, in polycondensation reactions provide a novel strategy and tool to synthesise highly porous PIs
- The surface area and CO₂ uptake were enhanced up to **842 m² g⁻¹** and **14 wt%**, respectively.

References

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- Liao et al, *Macromolecules*, **2015**, 48, 2064-2073.
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Future work:

Electrocatalytic CO₂ reduction

