

CHEM**NANO**MAT

Supporting Information

Deal;Designing Structurally Ordered Pt/Sn Nanoparticles in Ionic Liquids and their Enhanced Catalytic Performance

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Materials: All chemicals were dried in vacuum for 3 h prior to use. Metal salt precursors (PdCl_2 , $\text{Sn}(\text{ac})_2$ and SnCl_2) were purchased from Acros, Strem, and Sigma Aldrich, respectively. (*Trans*-cinnamaldehyde and KBET_3H (1M in THF) were purchased from Sigma Aldrich. Anhydrous THF was purchased from Sigma Aldrich and stored over molecular sieve (3 Å). $[\text{OMA}]\text{Br}$ was purchased from Sigma Aldrich and dried under vacuum at room temperature (16-32 h, 10^{-3} mbar), then at 70 °C (0.5-1 h, 10^{-3} mbar). ILs ($[\text{OMA}][\text{NTf}_2]$, $[\text{BMIm}][\text{NTf}_2]$, $[\text{BMIm}][\text{BF}_4]$, $[\text{BMIm}][\text{PF}_6]$, and $[\text{BMIm}][\text{PF}_6]$) were obtained from IoLiTec (H_2O content <100 ppm; halide content <100 ppm) and dried in vacuum prior to use (at 70 °C for 3 h, 10^{-3} mbar, then at room temperature for 16 h, 10^{-5} mbar).

Synthesis of $[\text{OMA}][\text{BEt}_3\text{H}]$ and $[\text{BMIm}][\text{BEt}_3\text{H}]$: At room temperature, $\text{K}[\text{BEt}_3\text{H}]$ (100 mL of a 1 M solution in THF) was added to the solution of 50 g $[\text{OMA}]\text{Br}$ or 50 g $[\text{BMIm}]\text{Cl}$, accordingly, in 100 mL THF. The reaction mixture was stirred for 3 h. KBr or KCl was removed by filtration after storing the solution at -40 °C overnight to yield $[\text{OMA}][\text{BEt}_3\text{H}]_{\text{THF}}$ or $[\text{BMIm}][\text{BEt}_3\text{H}]_{\text{THF}}$, respectively, as a clear, colorless to yellowish solution in THF (1.5 M).

UV-vis absorption spectroscopy: 0.25 mmol metal precursor salts (Pt:Sn 3:1; Pt:Sn 1:1) were dissolved in 4 mL IL and then diluted 1:2 by addition of the respective IL.

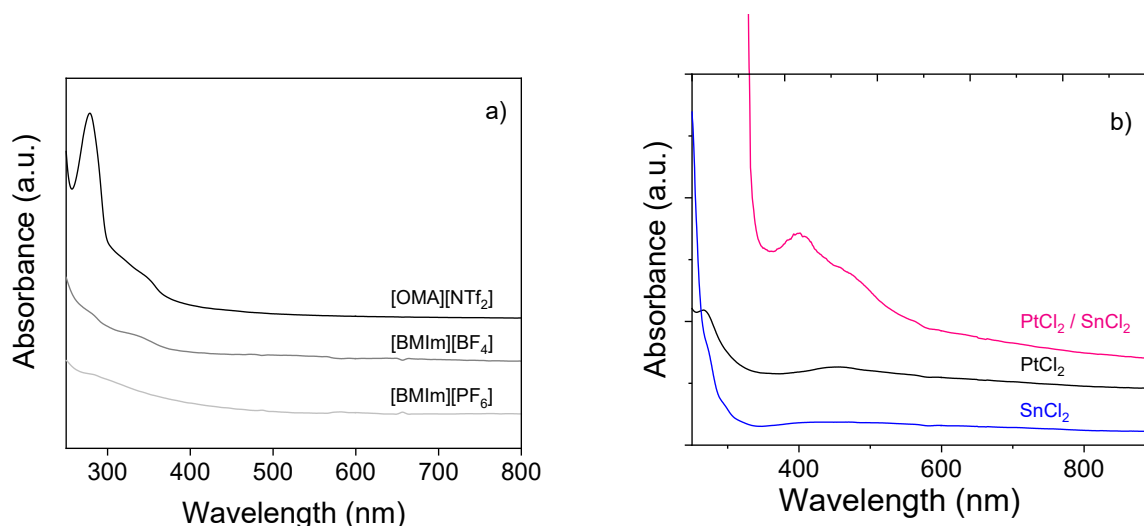


Figure S 1. UV-vis absorbance spectra of a) pure ILs ($[\text{BMIm}][\text{PF}_6]$, $[\text{BMIm}][\text{BF}_4]$, $[\text{OMA}][\text{NTf}_2]$) (spectra measured against air as a reference) and of b) PtCl_2 , SnCl_2 , and $\text{PtCl}_2 + \text{SnCl}_2$ 3:1 in $[\text{BMIm}][\text{BF}_4]$ (respective IL was used as a reference).

Table S1. Summary of absorption maxima observed for the precursors in different ILs.

Precursor	IL	Absorption maxima	Composition
PtCl_2	$[\text{OMA}][\text{NTf}_2]$	435 nm	-
SnCl_2		280 nm, 316 nm	-
$\text{PtCl}_2:\text{SnCl}_2$ (3:1)		359 nm	$\text{Pt}_3\text{Sn} / \text{PtSn} / \text{Pt}$
$\text{PtCl}_2:\text{SnCl}_2$ (3:2)		353 nm	$\text{Pt}_3\text{Sn} / \text{PtSn}$
PtCl_2	$[\text{BMIm}][\text{BF}_4]$	451 nm	-
SnCl_2		-	-
$\text{PtCl}_2:\text{SnCl}_2$ (3:1)		397 nm	PtSn

Indexed XRD patterns (References from Joint Committee of Powder Diffraction Standards (JCPDS) data base: Pt (JCPD 03-065-2868), Pt₃Sn (JCPD 03-065-0958), and PtSn (JCPD 03-065-0959), SnO₂ (JCPD 00-046-1088):

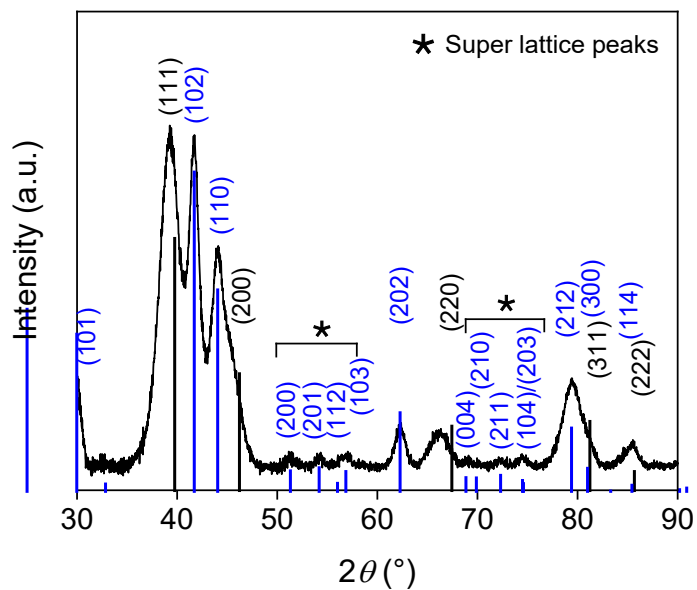


Figure S2. XRD pattern of NPs 4 (references: Pt (black), PtSn (blue)).

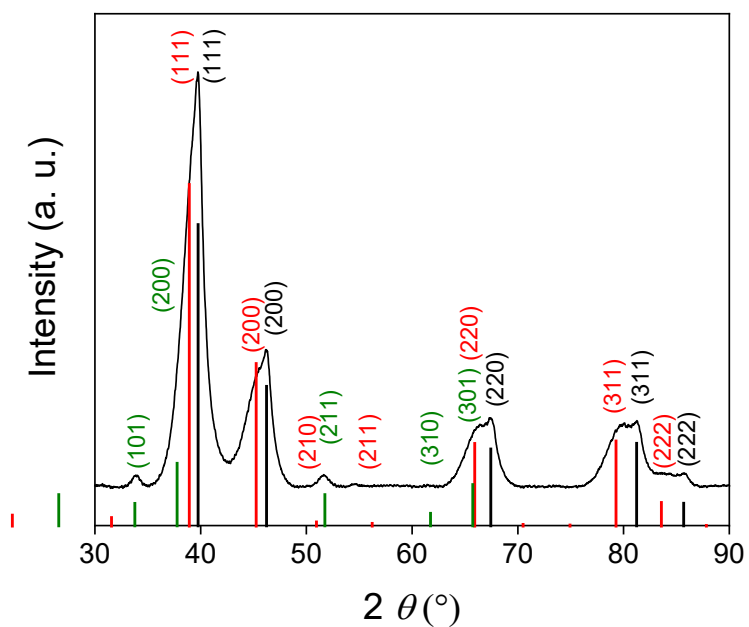


Figure S3. Indexed XRD pattern of NPs 1 (Pt (black), SnO₂ (green), Pt₃Sn (red)).

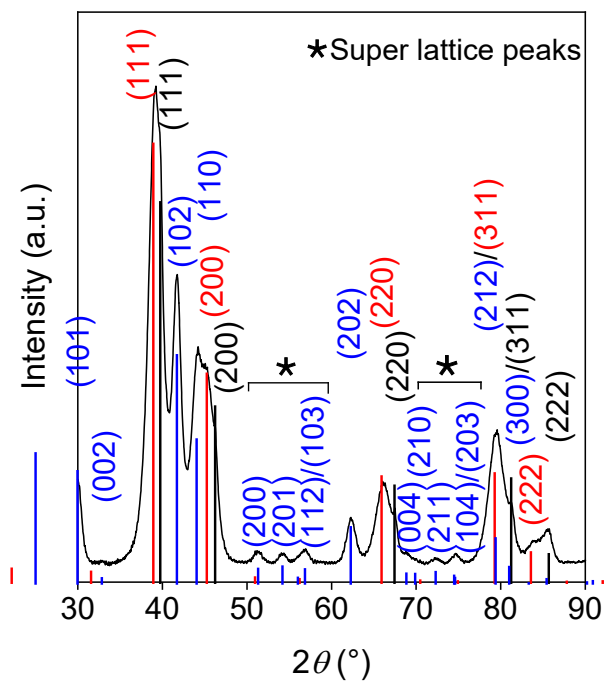


Figure S4. Indexed XRD pattern of NPs 2 (Pt₃Sn (red), PtSn (blue) and Pt (black))

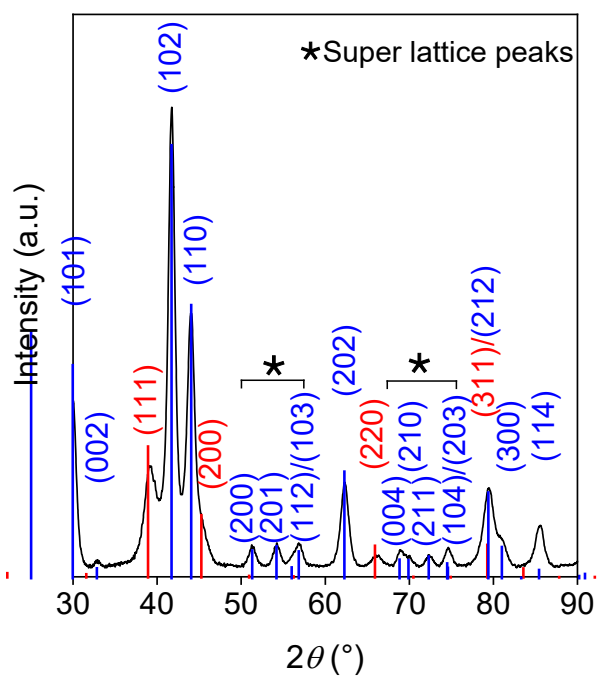


Figure S5. Indexed XRD pattern of a) NPs 3 and b) NPs 8a and 8b (Pt₃Sn (red), PtSn (blue)).

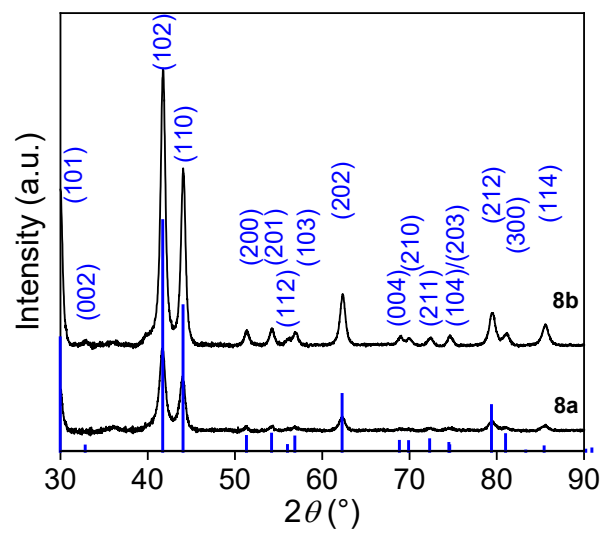


Figure S6. Indexed XRD pattern of (PtSn (blue)).