

Supplementary Materials

Highly Efficient Liquid-Phase Exfoliation of Layered Perovskite-like Titanates HLnTiO_4 and $\text{H}_2\text{Ln}_2\text{Ti}_3\text{O}_{10}$ ($\text{Ln} = \text{La}, \text{Nd}$) into Nanosheets

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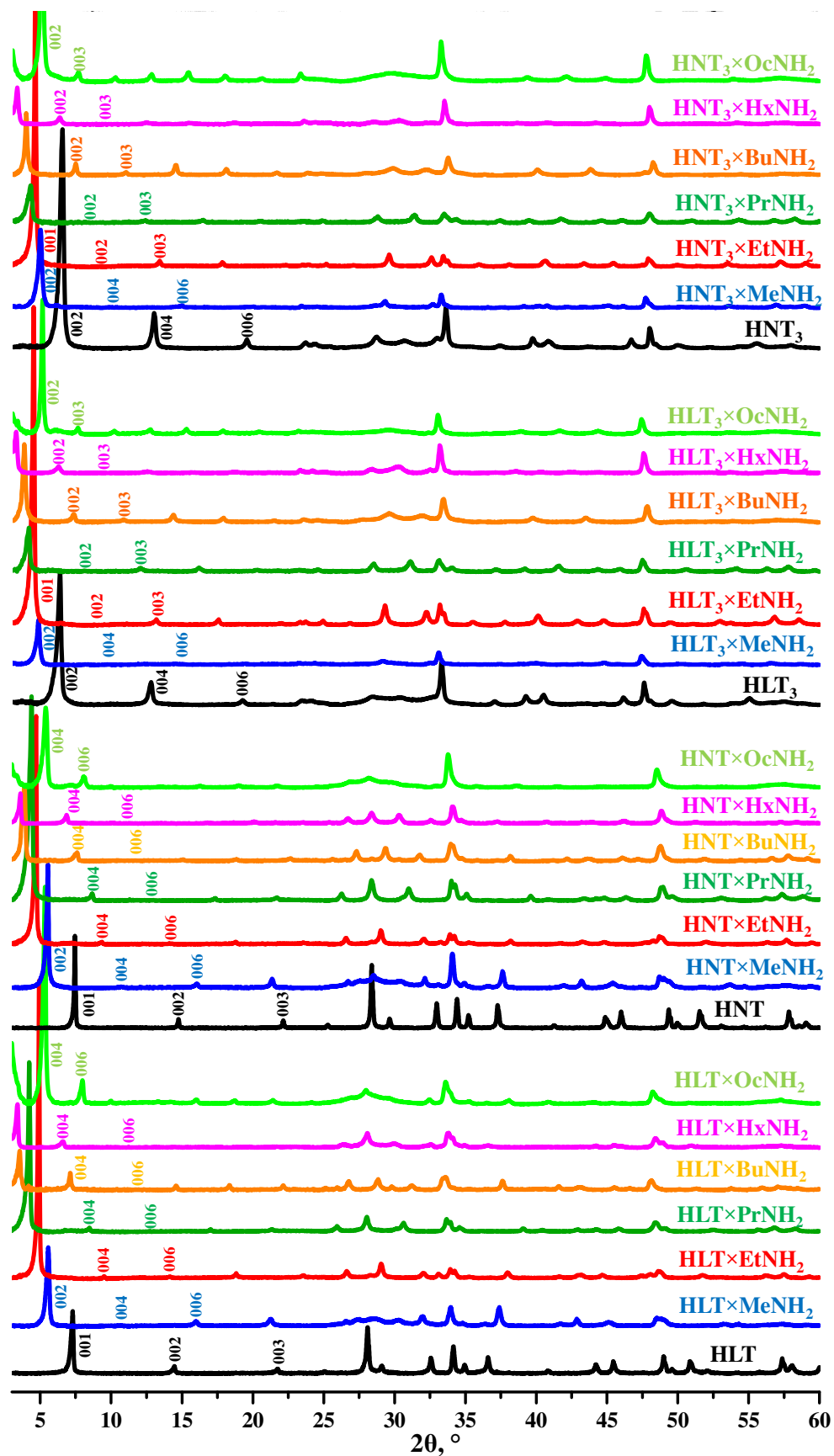


Figure S1. Powder XRD patterns of the protonated titanates and their *n*-alkylamine derivatives.

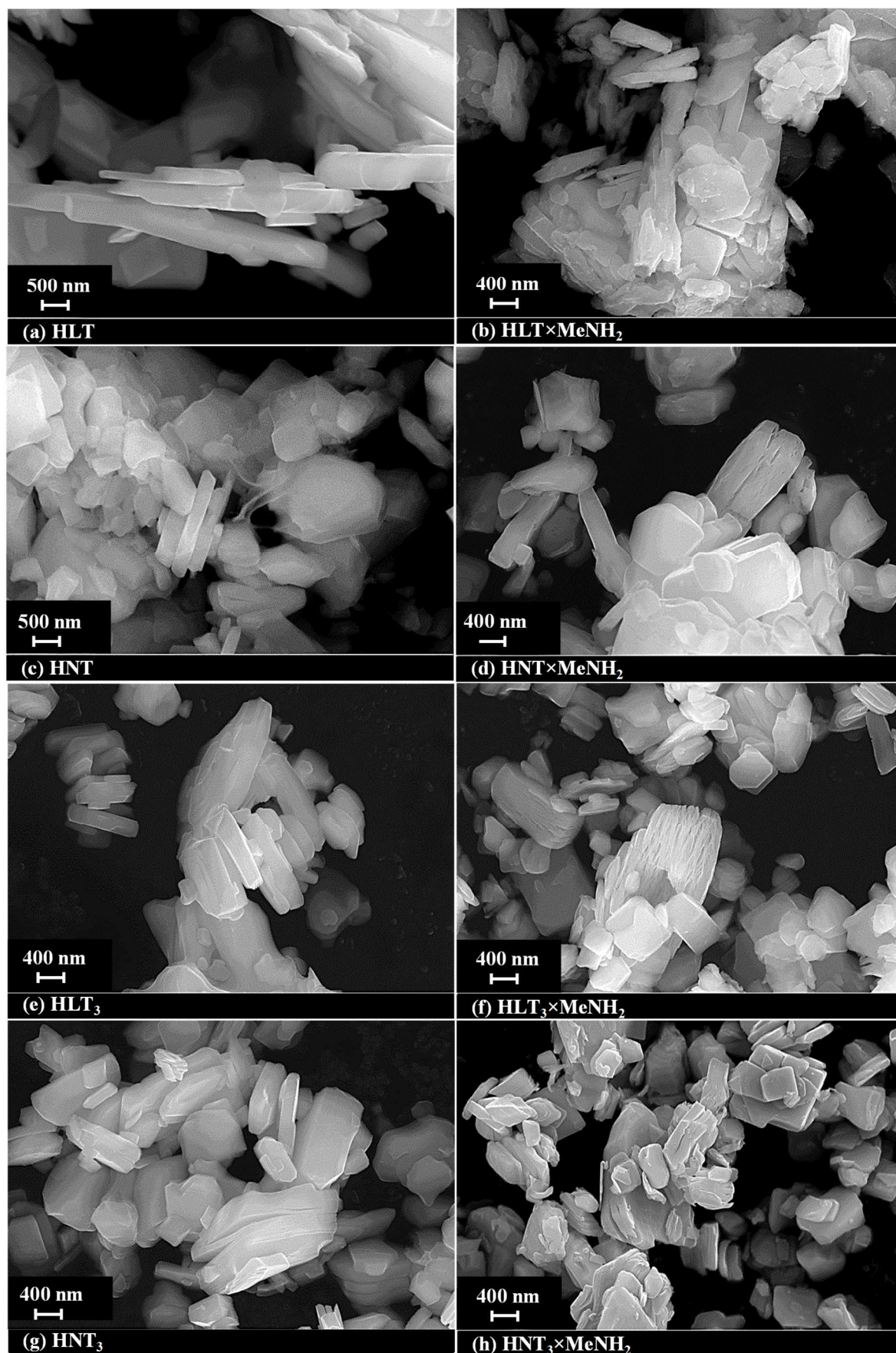


Figure S2. SEM images of the protonated and methylamine-intercalated titanates: HLT (a, b), HNT (c, d), HLT_3 (e, f) and HNT_3 (g, h).

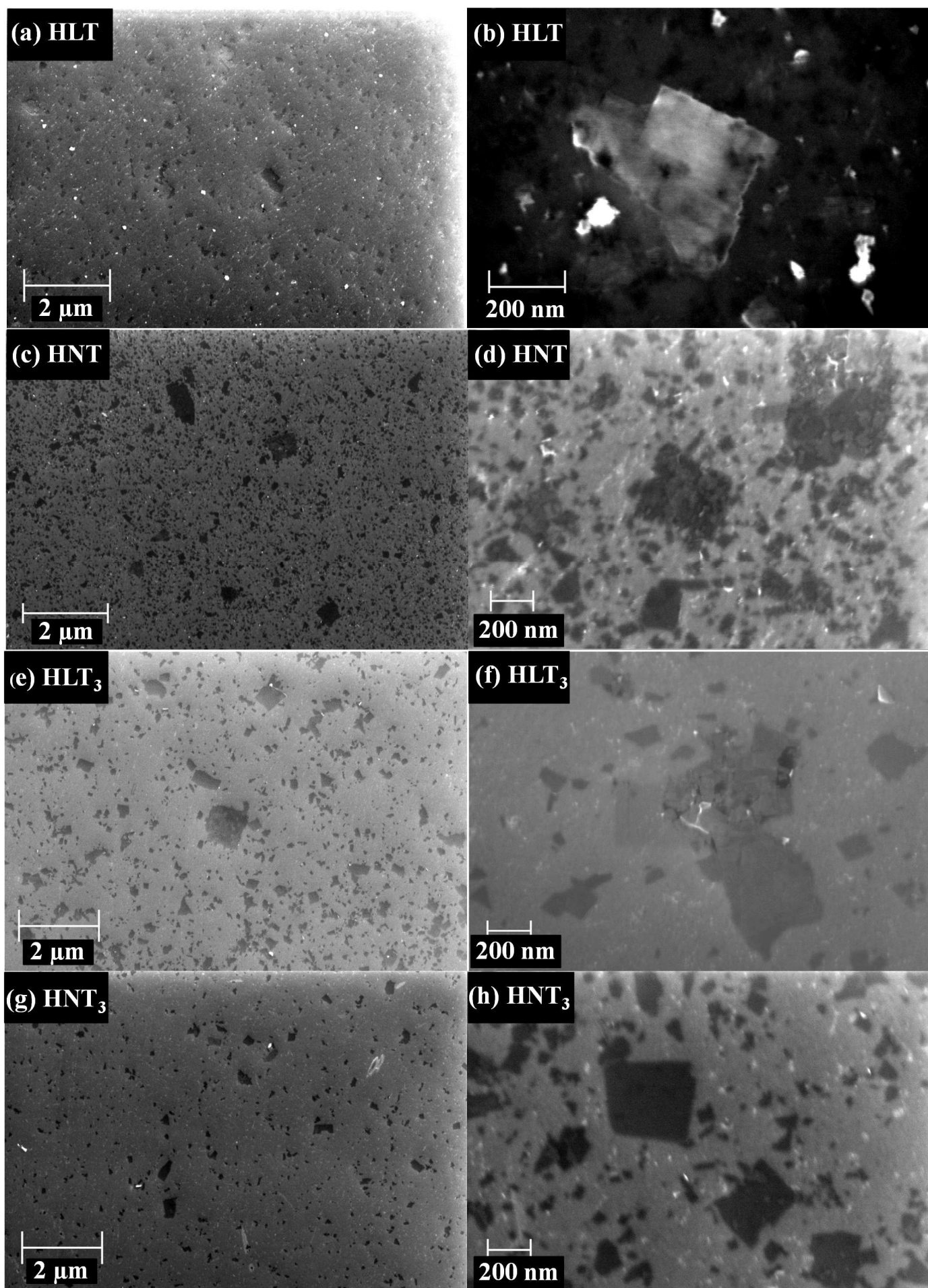


Figure S3. SEM images of HLT (a, b), HNT (c, d), HLT_3 (e, f) and HNT_3 (g, h) nanosheets on silicon substrates.

Table S1. Structure parameters and composition of initial compounds. Tetragonal lattice parameters, interlayer distances d as well as organic (x) and water (y) content per formula unit of the precursors for exfoliation. Compositions of the n -alkylamine derivatives are presented as $\text{HLnTiO}_4 \cdot x\text{RNH}_2 \cdot y\text{H}_2\text{O}$ and $\text{H}_2\text{Ln}_2\text{Ti}_3\text{O}_{10} \cdot x\text{RNH}_2 \cdot y\text{H}_2\text{O}$.

Sample	$a=b$, Å	c , Å	d , Å	x	y	Sample	$a=b$, Å	c , Å	d , Å	x	y
HLT	3.71	12.2	12.2	–	0.05	HLT ₃	3.79	27.2	13.6	–	0.15
xMeNH ₂	3.77	33.3	16.7	0.35	0.45	xMeNH ₂	3.83	36.7	18.4	0.70	0.30
xEtNH ₂	3.75	37.7	18.9	0.35	0.50	xEtNH ₂	3.82	20.2	20.2	0.70	0.35
xPrNH ₂	3.76	41.2	20.6	0.35	0.30	xPrNH ₂	3.82	21.7	21.7	0.65	0.20
xBuNH ₂	3.76	47.8	23.9	0.40	0.25	xBuNH ₂	3.81	24.7	24.7	0.70	0.35
xHxNH ₂	3.76	54.9	27.5	0.35	0.45	xHxNH ₂	3.87	29.4	29.4	0.80	0.10
xOcNH ₂	3.78	66.3	33.2	0.45	0.40	xOcNH ₂	3.85	34.2	34.2	0.80	0.10
HNT	3.68	12.1	12.1	–	0.10	HNT ₃	3.78	27.2	13.6	–	0.15
xMeNH ₂	3.74	33.1	16.6	0.35	0.40	xMeNH ₂	3.81	35.4	17.7	0.70	0.30
xEtNH ₂	3.74	37.6	18.8	0.45	0.20	xEtNH ₂	3.80	19.9	19.9	0.70	0.35
xPrNH ₂	3.74	40.4	20.2	0.45	0.40	xPrNH ₂	3.78	21.5	21.5	0.70	0.20
xBuNH ₂	3.74	47.7	23.9	0.45	0.30	xBuNH ₂	3.78	24.4	24.4	0.75	0.35
xHxNH ₂	3.72	54.0	27.0	0.45	0.35	xHxNH ₂	3.80	29.2	29.2	0.90	0.10
xOcNH ₂	3.81	65.4	32.7	0.45	0.40	xOcNH ₂	3.80	33.4	33.4	0.85	0.15

Table S2. Nanosheet concentrations and exfoliation yields achieved under various conditions.

Designations: m – precursor weight, P – sonication power, t_1 – single sonication duration, t_2 – stirring duration, F – separation factor, c – nanosheet concentration, η – nanosheet yield.

Variable parameter	Precursor	m, mg	TBAOH, M	Sonication		t ₂ , d	F	HLT		HNT		HLT ₃		HNT ₃	
				P, %	t ₁ , min			c, mg/L	η, %	c, mg/L	η, %	c, mg/L	η, %	c, mg/L	η, %
Physical exfoliation															
–	Protonated	30	0	100	5	1	1000	1.5	0.15	1.7	0.17	1.6	0.16	1.8	0.18
	×MeNH ₂							3.7	0.37	6.3	0.63	3.8	0.38	6.1	0.61
Chemical exfoliation															
–	Protonated	30	0.004	–	–	1	1000	2.3	0.23	2.7	0.27	2.4	0.24	2.6	0.26
	×MeNH ₂							5.0	0.50	17	1.7	10	1.0	13	1.3
Physical-chemical exfoliation															
Chain length of <i>n</i> -alkylamine	Protonated	30	0.004	50	5	1	1000	4.1	0.41	4.7	0.47	2.6	0.26	3.2	0.32
	×MeNH ₂							46	4.6	530	54	100	10	330	33
	×EtNH ₂							50	5.0	750	75	170	17	460	46
	×PrNH ₂							48	4.8	510	51	140	14	79	7.9
	×BuNH ₂							13	1.3	6.5	0.65	4.5	0.45	8.6	0.86
	×HxNH ₂							11	1.1	5.3	0.53	4.1	0.41	5.4	0.54
	×OcNH ₂							3.6	0.36	4.9	0.49	3.7	0.37	4.0	0.40
Precursor weight	×EtNH ₂	90	0.012	50	5	1	1000	115	3.8	1500	50	340	11	960	32
		150	0.02					160	3.2	2100	42	480	9.6	1200	24
TBAOH concentration	×EtNH ₂	30	0.002	50	5	1	1000	21	2.1	290	29	85	8.5	260	26
			0.008					35	3.5	610	61	150	15	390	39
Sonication power	×EtNH ₂	30	0.004	25	5	1	1000	27	2.7	390	39	99	9.9	270	27
				100				52	5.2	740	74	180	18	450	45
Sonication duration	×EtNH ₂	30	0.004	50	1	1	1000	39	3.9	620	62	140	14	390	39
					10			53	5.3	770	77	180	18	480	48
Stirring duration	×EtNH ₂	30	0.004	50	5	7	1000	250	25	930	93	740	74	890	89
						21		270	27	950	95	810	81	920	92
Separation factor	×EtNH ₂	30	0.004	50	5	1	100	230	23	850	85	700	70	910	91
							500	95	9.5	770	77	310	31	720	72