

Supporting Information

Unveiling the potential of redox chemistry to form size tunable, high index silicon particles

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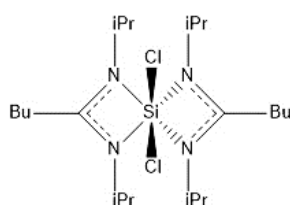


Figure S1. Molecular structure of bis(*N,N'*-diisopropylbutylamidinate) dichlorosilane. Referred to as $\text{SiCl}_2[\text{BuC}(\text{N}^i\text{Pr})_2]_2$ throughout this publication.

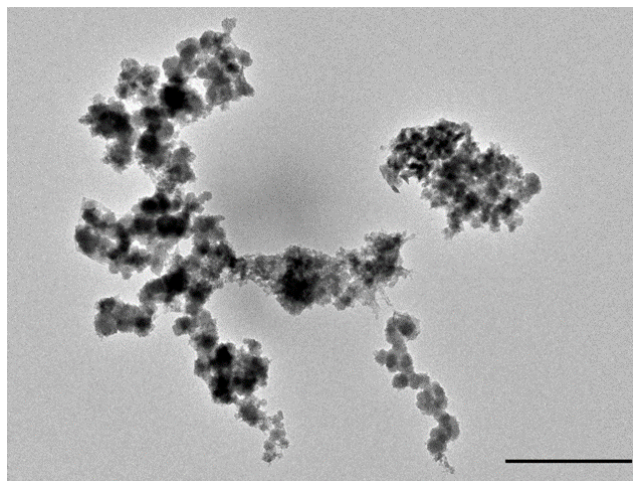


Figure S2. Particles produced when excess sodium silicide is reacted with $\text{SiCl}_2[\text{BuC}(\text{N}^i\text{Pr})_2]_2$ in toluene (1.5 : 1 molar ratio). Scale bar represents 1 μm .

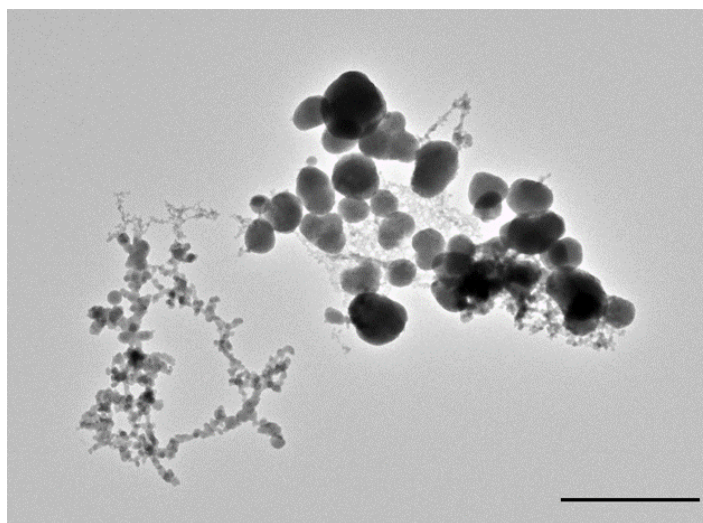


Figure S3. TEM image of particles formed when 5 molar eq. $\text{SiCl}_2[\text{BuC}(\text{NiPr})_2]_2$ is reacted with 1 molar eq. Na_4Si_4 in toluene for 16 hours. Scale bar represents $1\ \mu\text{m}$.

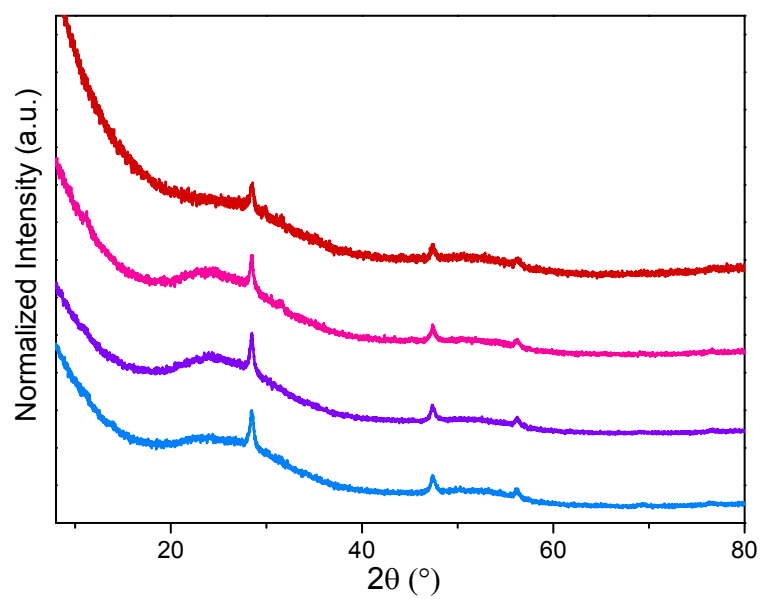


Figure S4. Powder X-ray diffractograms of particles produced when sodium silicide is reacted with $\text{SiCl}_2[\text{BuC}(\text{NiPr})_2]_2$ in toluene for 16 hours with a (blue) 1:1:5 molar ratio, (purple) 1:2 ratio, (pink) 1:3 ratio, and (red) 1:4 ratio.

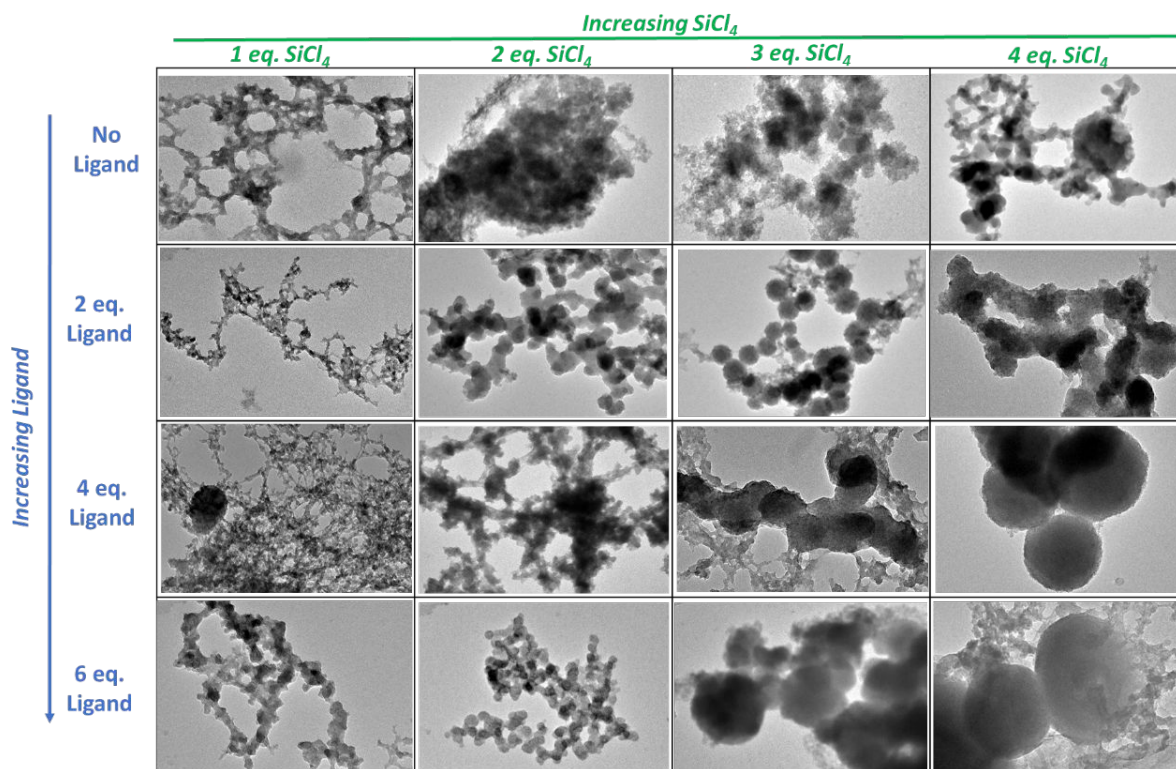
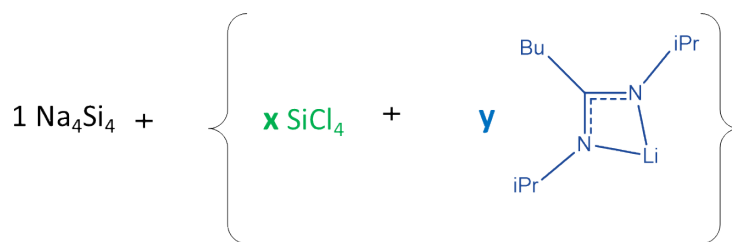


Figure S5. Additional experiments varying the quantity of Si (IV) species and ligand separately to a fixed quantity of Na_4Si_4 in toluene and reacted for 16 hours. An overall reaction concentration of 20 mmol was maintained in all cases.

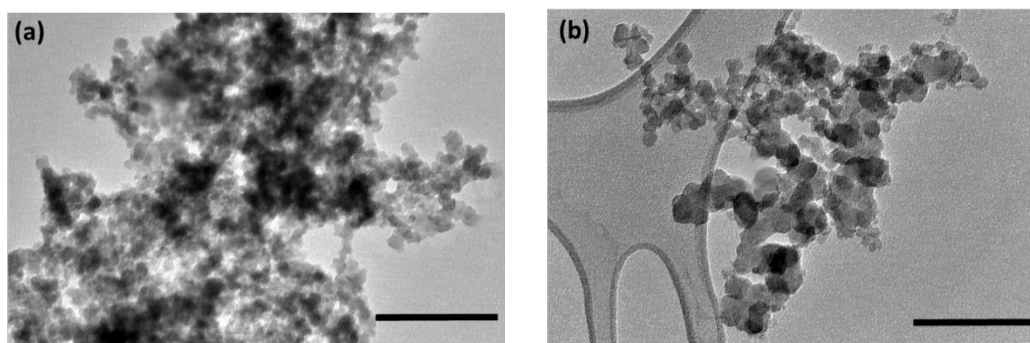


Figure S6. Growth experiments stopped early, (a) after 1 hour and (b) after 4 hours using 2 eq $\text{SiCl}_2[\text{BuC}(\text{N}^i\text{Pr})_2]_2$ with 1 eq. Na_4Si_4 in toluene. Scale bars represent 200 nm.

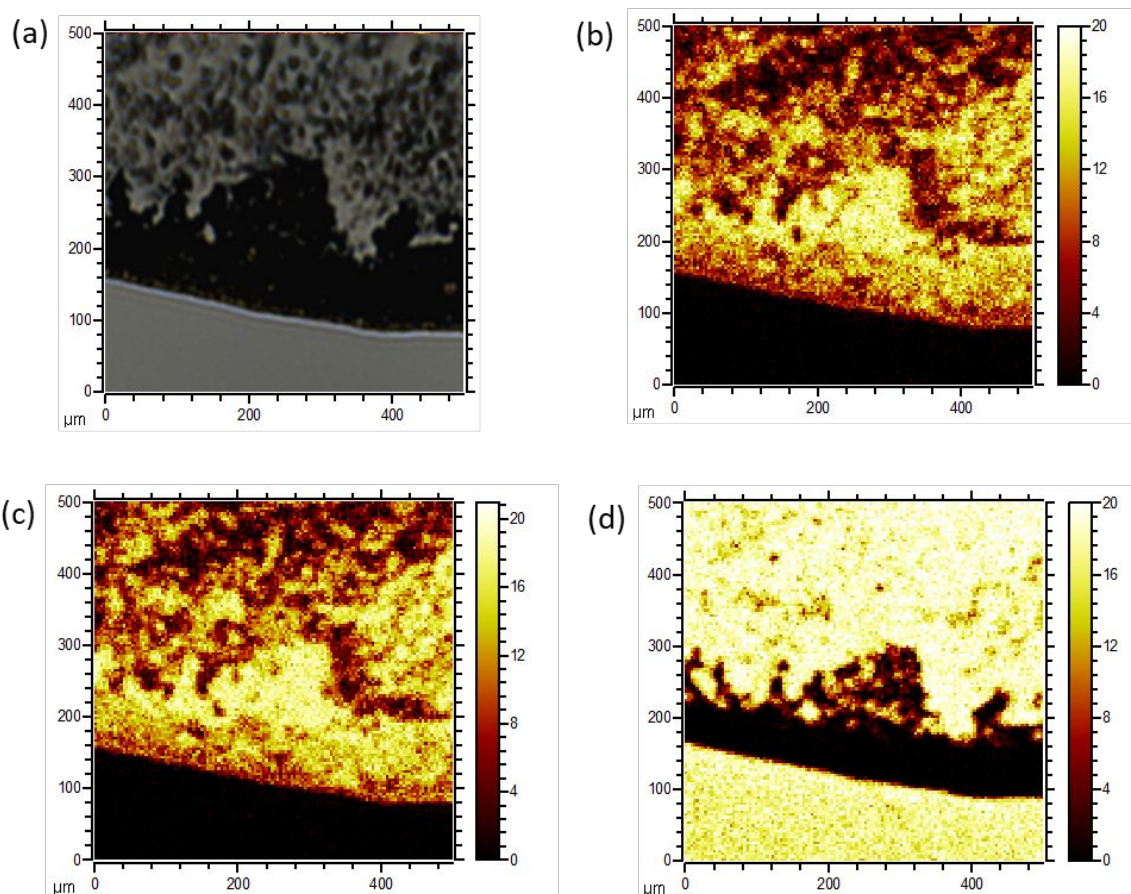


Figure S7. Optical image (a) and ToF-SIMS images of particles formed using $n=2$ eq. $\text{SiCl}_2[\text{BuC}(\text{N}^i\text{Pr})_2]_2$ corresponding to (b) m/z peak at 255, (c) m/z peak at 283, (d) m/z peak for Au.

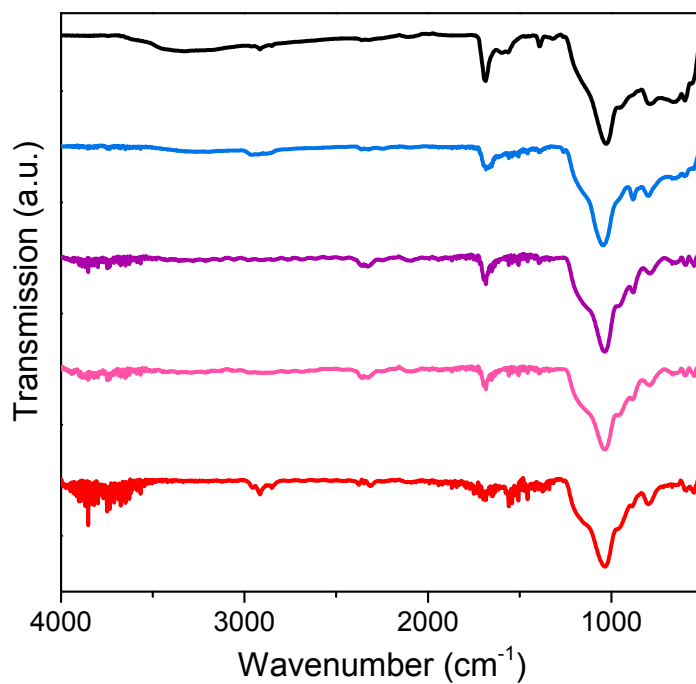


Figure S8. ATR-FTIR spectroscopy of particles produced when sodium silicide is reacted with $\text{SiCl}_2[\text{BuC}(\text{N}^i\text{Pr})_2]_2$ in toluene for 16 hours with a (black) 1:1, (blue) 1:1:5, (purple) 1:2, (pink) 1:3, and (red) 1:4 molar ratio.

Table S1. Actual precursor quantities used to maintain 20 mmol concentration in 8 mL toluene.

Molar Ratio	mg	
	$\text{SiCl}_2[\text{BuC}(\text{N}^i\text{Pr})_2]_2$	Na_4Si_4
1 : 1	37.4	16.5
1 : 1.5	44.3	13.2
1 : 2	49.9	11.0
1 : 3	54.5	9.0
1 : 4	59.9	6.6
1 : 5	62.4	5.5

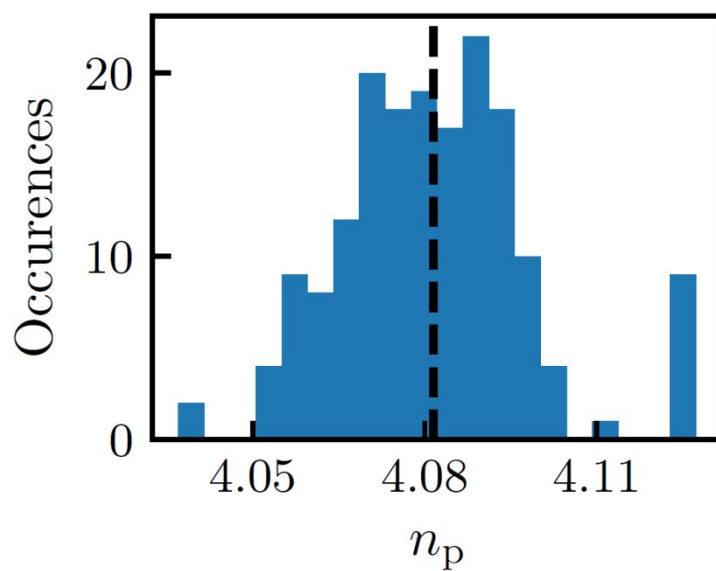


Figure S9. The distribution of measured indices computed from 170 interference pattern images, captured by a single particle formed using $n=4$ eq. $\text{SiCl}_2[\text{BuC}(\text{N}^i\text{Pr})_2]_2$.