

Supplementary Data ST1: Comparison between TiO<sub>2</sub> content of tridymite measured using SEM EDS and EPMA WDS. Values are in wt % oxide, with 1 sigma standard deviation. All values come from at least 5 measurements.

| bulk TiO <sub>2</sub> | T<br>(°C) | SEM EDS |      | EPMA WDS |      |
|-----------------------|-----------|---------|------|----------|------|
|                       |           | value   | SD   | value    | SD   |
| 20                    | 1225      | 1.46    | 0.05 | 1.44     | 0.04 |
| 20                    | 1251      | 1.59    | 0.13 | 1.54     | 0.05 |
| 20                    | 1277      | 1.74    | 0.09 | 1.77     | 0.02 |
| 20                    | 1301      | 1.75    | 0.05 | 1.80     | 0.05 |
| 5                     | 1375      | 0.27    | 0.02 | 0.23     | 0.03 |
| 5                     | 1350      | 0.27    | 0.03 | 0.25     | 0.01 |
| 5                     | 1325      | 0.28    | 0.01 | 0.32     | 0.12 |

Supplementary Data ST2: Comparison between glass compositions for Ti<sub>20</sub>NS<sub>8</sub> glass measured using SEM EDS, EPMA WDS, and the known starting bulk composition. Glass was synthesized at 1325 °C for 24 hr. Data is in atomic %, normalized to 100% with O calculated from stoichiometry. Standard deviation is 1 sigma.

|    | SEM EDS n=10 |      | EPMA WDS<br>n=12 |      | Calculated |
|----|--------------|------|------------------|------|------------|
|    | value        | SD   | value            | SD   | value      |
| Na | 5.89         | 0.49 | 4.79             | 0.19 | 5.93       |
| Si | 24.28        | 0.33 | 23.85            | 0.07 | 23.70      |
| Ti | 6.70         | 0.36 | 6.51             | 0.07 | 6.67       |
| O  | 63.13        | 0.20 | 64.85            | 0.29 | 63.70      |