Supplementary Material

Table1: Percentage X-ray and neutron scattering weights for reference Glass 1

Pair correlation	Percentage X-ray Weight	Percentage Neutron Weight
B-B	0.005	0.066
B-Bi	0.469	0.460
B-Si	0.311	0.891
B-Na	0.042	0.129
B-K	0.032	0.059
B-Ti	0.022	0.034
B-F	0.056	0.338
B-O	0.485	3.108
Bi-Bi	10.825	0.796
Bi-Si	14.347	3.085
Bi-Na	1.927	0.445
Bi-K	1.465	0.203
Bi-Ti	0.995	0.118
Bi-F	2.570	1.172
Bi-O	22.379	10.767
Si-Si	4.754	2.990
Si-Na	1.277	0.863
Si-K	0.971	0.393
Si-Ti	0.659	0.230
Si-F	1.703	2.272
Si-O	14.831	20.869
Na-Na	0.086	0.062
Na-K	0.130	0.056
Na-Ti	0.089	0.033
Na-F	0.229	0.329
Na-O	1.992	3.012
K-K	0.050	0.013
K-Ti	0.067	0.015
K-F	0.174	0.149
K-O	1.514	1.372
Ti-Ti	0.023	0.004
Ti-F	0.118	0.087
Ti-O	1.028	0.803
F-F	0.153	0.431
F-O	2.657	7.928
O-O	11.567	36.413

Table2: Theoretical and experimentally determined composition of Glass 1A

Glass 1A	Theoretical (mol%)	Measured (mol%)
B	1.97	1.94
Bi	5.48	5.81
Si	21.53	21.35
Na	3.68	3.81
K	1.62	1.58
Ti	0.95	0.98
F	6	5.56
O	58.77	58.97

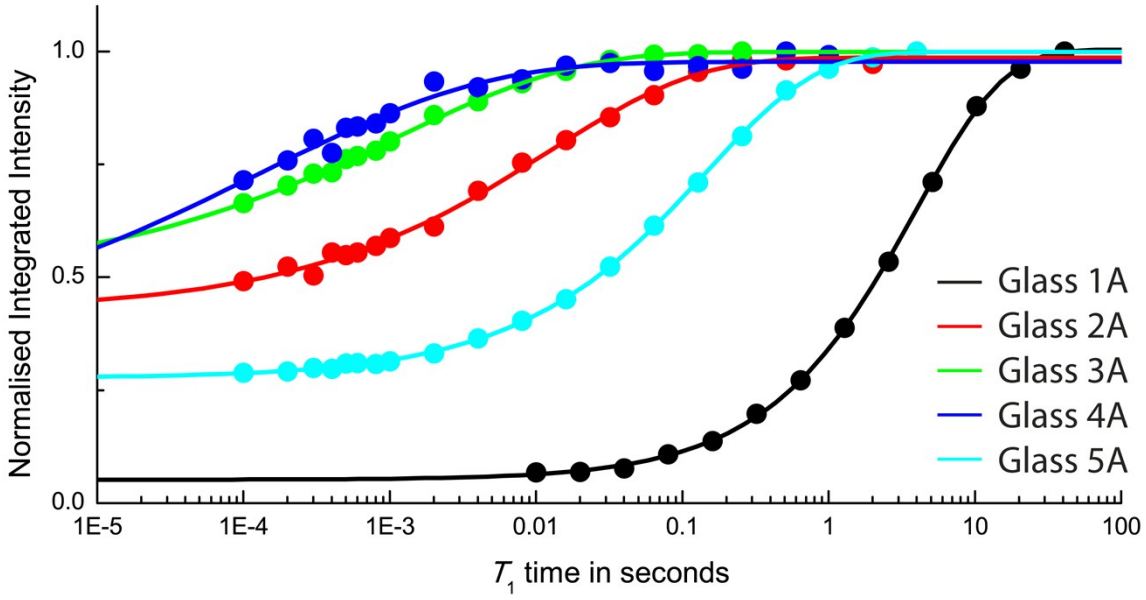

Figure S1: ^{11}B saturation recovery curves fitted to stretched exponentials for each glass

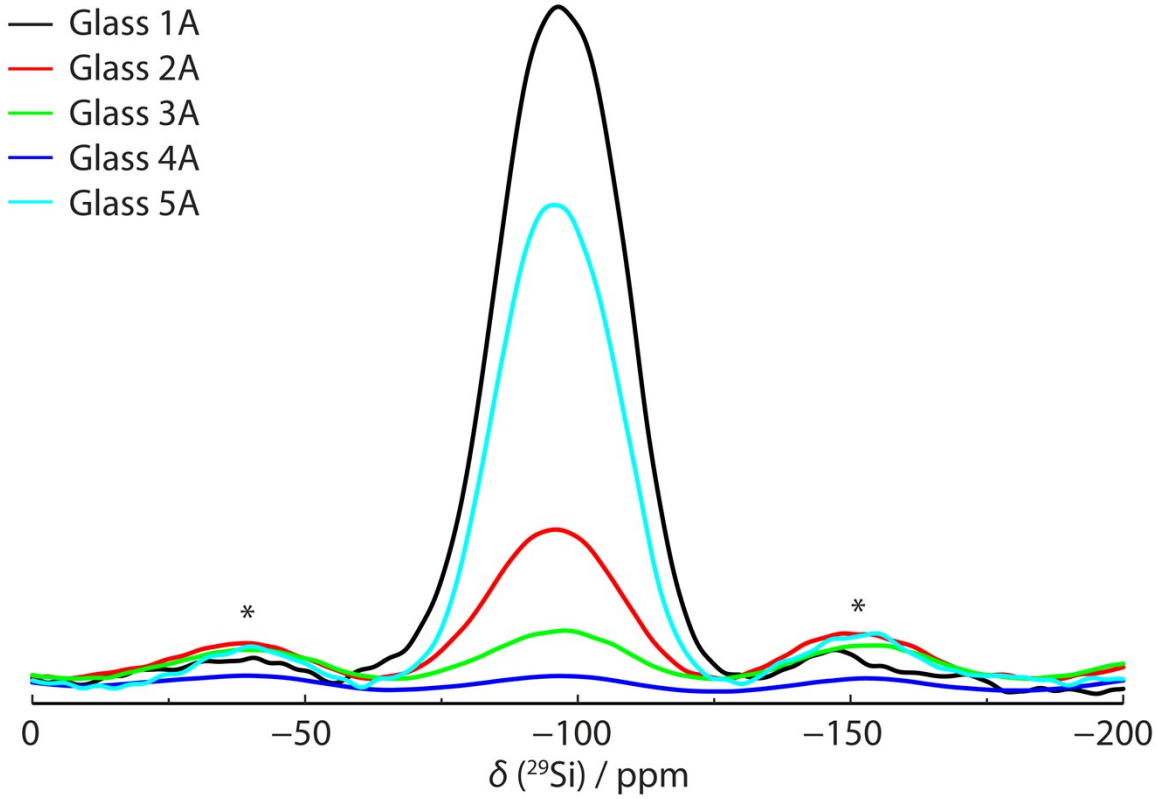

Figure S2: Normalised ^{29}Si solid state MAS NMR spectra showing the effect of paramagnetic wipe-out on the signal, asterisks denote spinning sidebands, for each glass.