Supplementary Information

Mobility of Proton Carriers in Phosphate Glasses Depends on Polymerization of Phosphate Framework

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Table S1 Positions of the fitted peaks of the v_{OH} band and integrated area ratio of the band at ~3300 cm^{-1} (A_{3300}) to that at ~2800 cm^{-1} (A_{2800}) in the IR spectra of the glasses after APS.

	Compositions				
	x=28	*x*=32	*x*=35	*x*=38	*x*=40
Peak position of v_{OH} band at ~2800 cm^{-1} (cm^{-1})	2827	2860	2880	2894	2895
Peak position of v_{OH} band at ~3300 cm^{-1} (cm^{-1})	3271	3302	3319	3315	3324
Integrated area ratio of A_{3300}/A_{2800}	0.1008	0.1150	0.1208	0.1456	0.1644

Calculation of the proton mobility of $25NaO_{1/2}$-$8LaO_{3/2}$-$1GeO_2$-$66PO_{5/2}$ glass after APS at 200 °C

The proton conductivity of $25NaO_{1/2}$-$8LaO_{3/2}$-$1GeO_2$-$66PO_{5/2}$ glass after APS was reported at a temperature higher than 250 °C in our previous paper.[1] The conductivity values at 250 and 300°C were 6.2×10^{-6} and 5.4×10^{-5} S cm^{-1}, respectively. Therefore, we extrapolated the proton conductivity at 200 °C ($\sigma_H = 5.2\times10^{-7}$ S cm^{-1}) to determine the proton mobility at 200 °C. The value of n_H used for the calculation was 4.8×10^{21} cm^{-3}. The proton mobility of the glass after APS was determined to be 6.8×10^{-10} cm^2 V^{-1} s^{-1} at 200 °C, as calculated from σ_H and n_H.

References

1. K. Kawaguchi, T. Yamaguchi, T. Omata, T. Yamashita, H. Kawazoe and J. Nishii, *Phys. Chem. Chem. Phys.,* 2015, **17**, 22855.