Supporting Information
Broad Range Variable-Temperature Solid State NMR Spectral and Relaxation Investigation of the Water State in Nafion 117

Ren-Hao Cheng[a], Honghao Cai[b], Yu-Ren Huang[c], Zhong Chen[d], Hsuan-Ying Chen[e], Shangwu Ding[a,*]

[a] Department of Chemistry and Center for Nanoscience and Nanotechnology, National Sun Yat-sen University, 70 Lien-Hai Road, Kaohsiung, 80424,Taiwan R.O.C.
[b] School of Science, Jimei University, Xiamen, China.
[c] Department of Applied Science, ROC Naval Academy, 669 Academy Road, Kaohsiung, Taiwan, R.O.C.
[d] Department of Electronic Science, Fujian Provincial Key Laboratory of Plasma and Magnetic Resonance, State Key Laboratory of Physical Chemistry of Solid Surfaces, Xiamen University, Xiamen, China
[e] Department of Medicinal and Applied Chemistry, Kaohsiung Medical University, 100, Shih-Chuan 1st Road, Kaohsiung, 80708, Taiwan

In this supplementary information, the variable temperature ^{2}H NMR spectra of fully hydrated pristine Nafion 117 and Nafion 117 samples substituted by lithium and sodium cations are presented. The narrow spectra (all smaller than 4 ppm) confirms that a significant portion of water remains unfrozen down to -60 ^{o}C. Note that because of a much smaller gyromagnetic ratio of ^{2}H than that of proton, its S/N is much smaller hence a much longer data acquisition time for each measurement point, that limited the measurement points from + 15 ^{o}C to – 60 ^{o}C, rather than + 20 ^{o}C to –70 ^{o}C used in ^{1}H experiments.

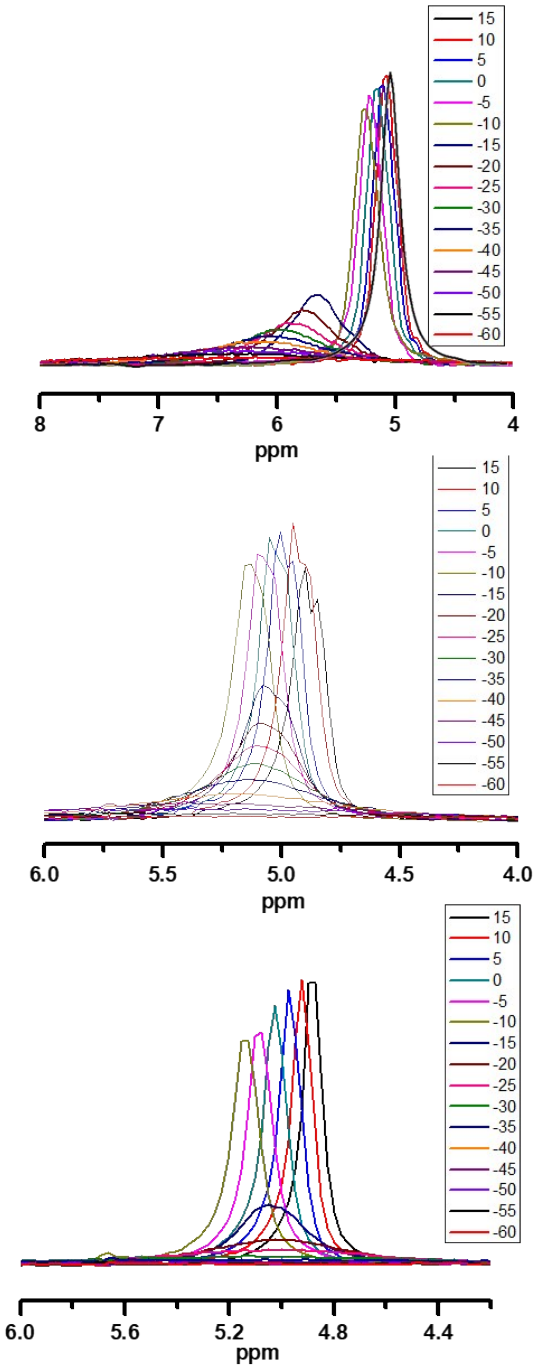

Figure S1 The broad variable temperature ^{2}H spectra of D_2O in fully hydrated pristine Nafion samples and substituted with lithium and sodium, respectively.