Electronic Supplementary Information

Chemical Composition Characterization of Poly(vinylidene fluoride-chlorotrifluoroethylene) Based Copolymers with F-H Decoupled ^{1}H NMR

Honghong Gong, Xiaomeng Zhang, Yanan Zhang, Aqun Zheng, Shaobo Tan, Zhicheng Zhang*

Department of Applied Chemistry, MOE Key Laboratory for Nonequilibrium Synthesis and Modulation of Condensed Matter, School of Science, Xi'an Jiaotong University, Xi'an, P. R. China, 710049

*Email: zhichengzhang@mail.xjtu.edu.cn

Result and Discussion

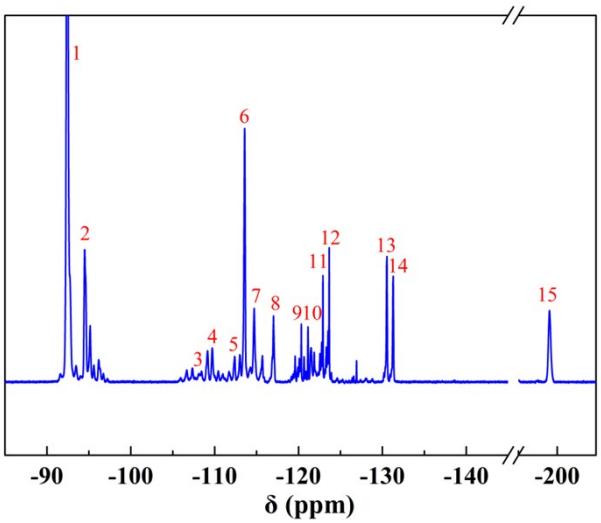

Fig. S1 ^{19}F NMR spectrum of the P(VDF-TrFE-CTFE) terpolymer.

Table S1 Chemical shifts and assignments of ^{19}F NMR peaks of the P(VDF-TrFE-CTFE) terpolymer.

Peak no.	Sequence	Chemistry shift (ppm)
1	–$CF_2CH_2C\boldsymbol{F}_2CH_2CF_2$–	-92.4
2	–$CH_2CH_2C\boldsymbol{F}_2CH_2CF_2$–	-94.5 ~ -96.2
3	–$CF_2CFClC\boldsymbol{F}_2CFClCF_2$–	-106.7 ~ -109.7
4	–$CF_2CH_2C\boldsymbol{F}_2CF_2CFCl$–	-109.7
5	–$CF_2CFClC\boldsymbol{F}_2CFClCH_2$–	-112.3 ~ -112.9
6	–$CF_2CH_2C\boldsymbol{F}_2CF_2CFH$–	-113.0
7	–$CF_2CH_2C\boldsymbol{F}_2CF_2CH_2$–	-114.7
8	–$CH_2CF_2C\boldsymbol{F}_2CH_2CH_2$–	-117.0
9	–$CH_2CF_2C\boldsymbol{F}_2CFClCH_2$–	-119.6 ~ -120.3
10	–$CF_2CF_2C\boldsymbol{F}ClCH_2CF_2$–	-121.1 ~ -121.8
11	–$CF_2CFHC\boldsymbol{F}_2CFHCF_2$–	-122.9
12	–$CF_2CFHC\boldsymbol{F}_2CFHCH_2$–	-123.6
13	–$CH_2CF_2C\boldsymbol{F}_2CFHCH_2$–	-130.5
14	–$CF_2CFClC\boldsymbol{F}_2CFHCH_2$–	-131.2
15	–$CH_2CF_2C\boldsymbol{F}HCF_2CH_2$–	-199.0

Fig. S1 shows the ^{19}F NMR spectrum of a P(VDF-TrFE-CTFE) terpolymer and the assignments of the peak are listed in Table S1.

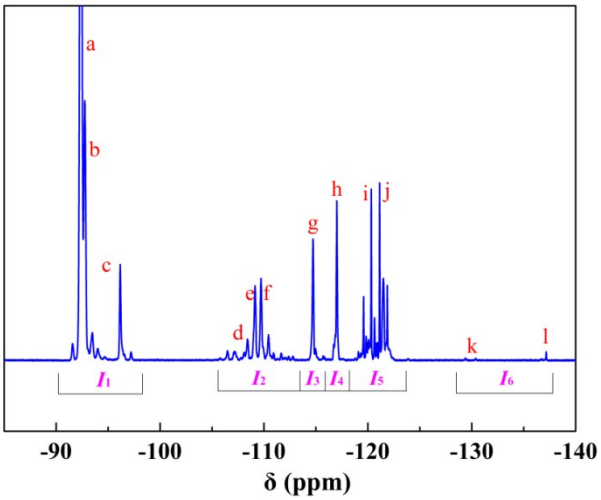

Fig. S2 ^{19}F NMR spectrum of the P(VDF-CTFE) copolymer (VDF/CTFE = 91.0/9.0).

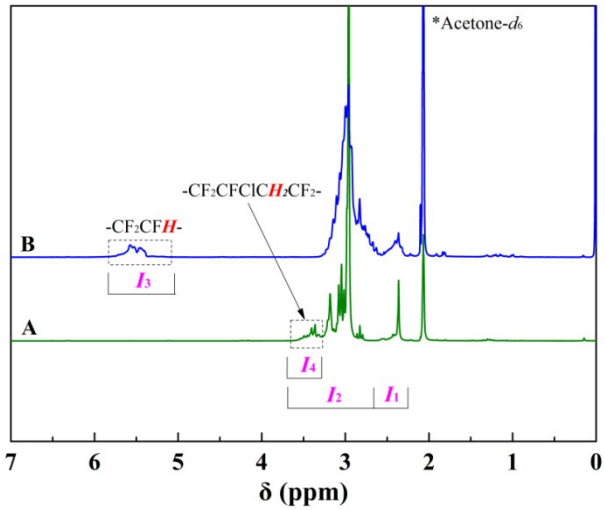

Fig. S3 (A) F-decoupled ^{1}H NMR spectrum of a P(VDF-CTFE) (VDF/CTFE = 91.0/9.0) sample and (B) ^{1}H NMR of its full hydrogenation product P(VDF-TrFE).

Fig. S2 shows the ^{19}F NMR spectrum of a P(VDF-CTFE) copolymer. The molar ratio of main chain could be calculated by the equation, VDF/CTFE = $3(I_1 + I_2 + 3I_3 - I_4)/2[I_5 + I_6 + 2(I_4 - I_3)]$, the chemical composition of P(VDF-CTFE) is calculated to be VDF/CTFE = 91.0/9.8 mol%. Fig. S3 shows the corresponding F-decoupled ^{1}H

NMR spectra of P(VDF-CTFE) and ^{1}H NMR of its full hydrogenation product. From Fig. S3B, the peaks integral of I_1, I_2, I_3 and the equation, TrFE/VDF = $2I_3/(I_1 + I_2)$, the chemical composition of P(VDF-CTFE) is calculated to be VDF/CTFE = 91.0/9.0 mol%. From Fig. S3A, the peaks integral of I_1, I_2, I_4 and the equation, CTFE/VDF = $I_4/(I_1 + I_2)$, the chemical composition of the same sample is calculated to be VDF/CTFE = 91.0/8.3 mol%, which is slightly smaller than the other two methods mentioned above. And the reason has been explained in the main text. The composition results calculated from both hydrogenation method and F-H decoupled method agree very well suggesting the accuracy of F-H decoupled ^{1}H NMR.