

Supplementary information for:

# Plasticizing and crosslinking effects of borate additives on the structure and properties of poly(vinyl acetate)

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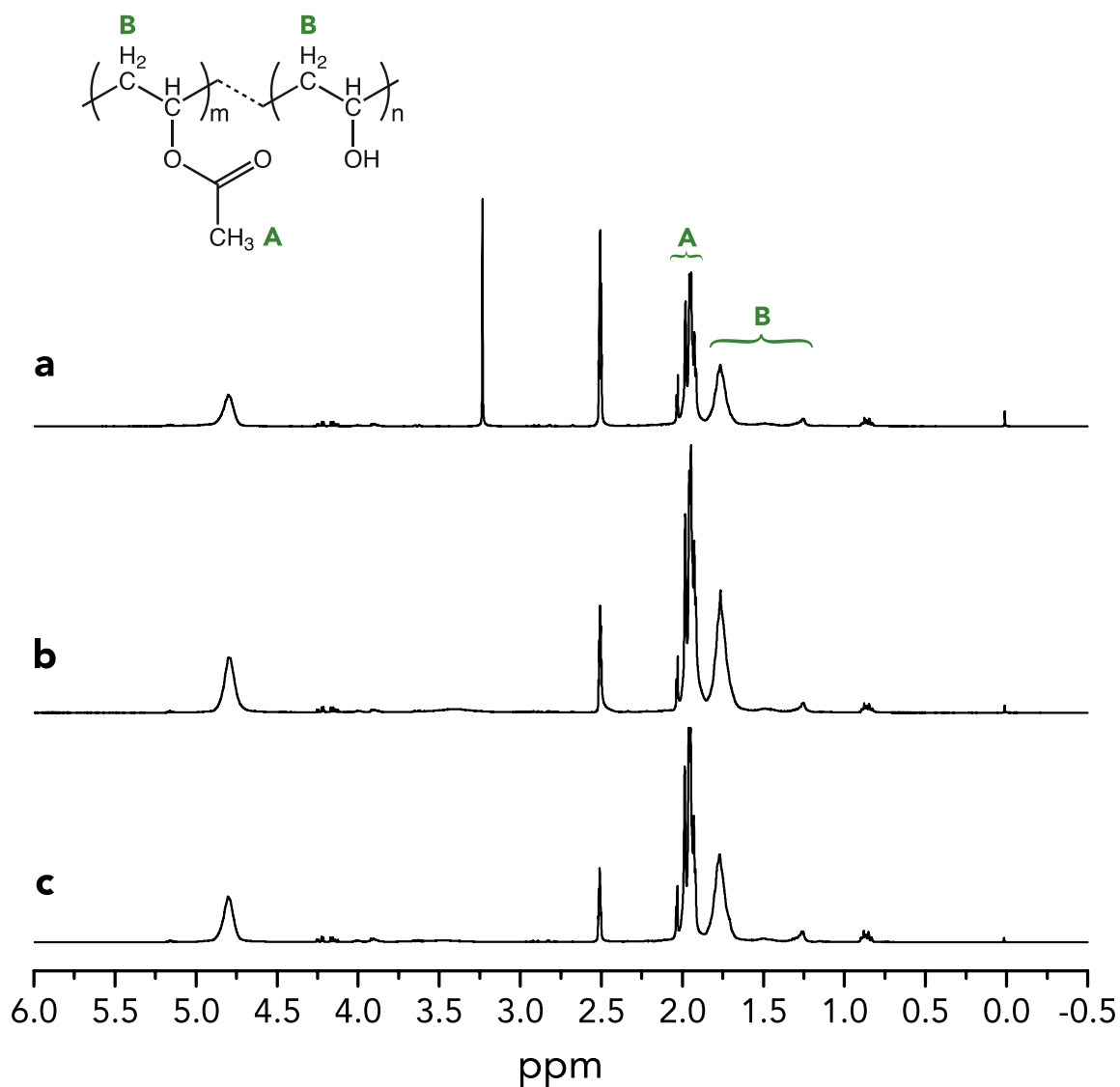
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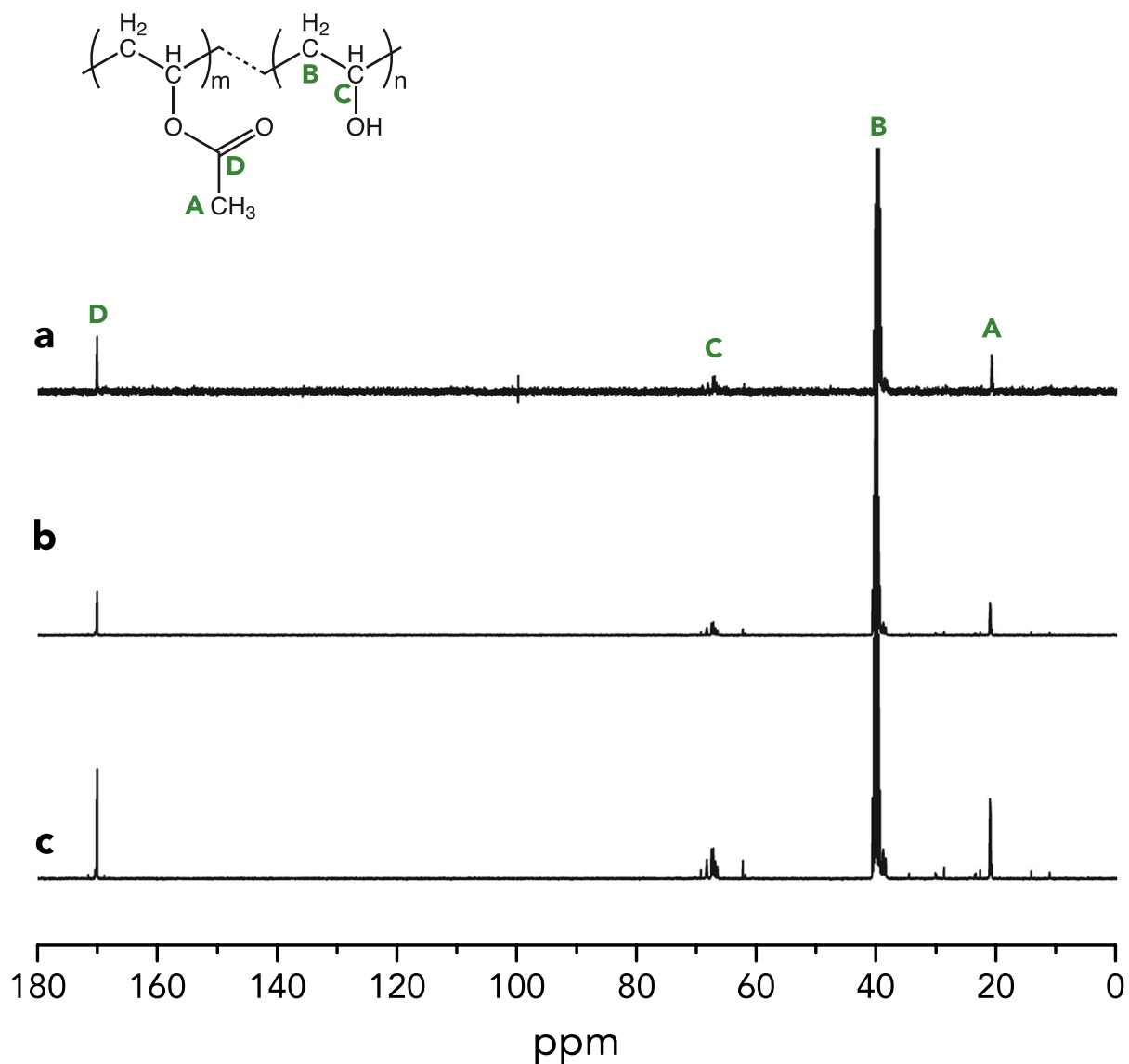
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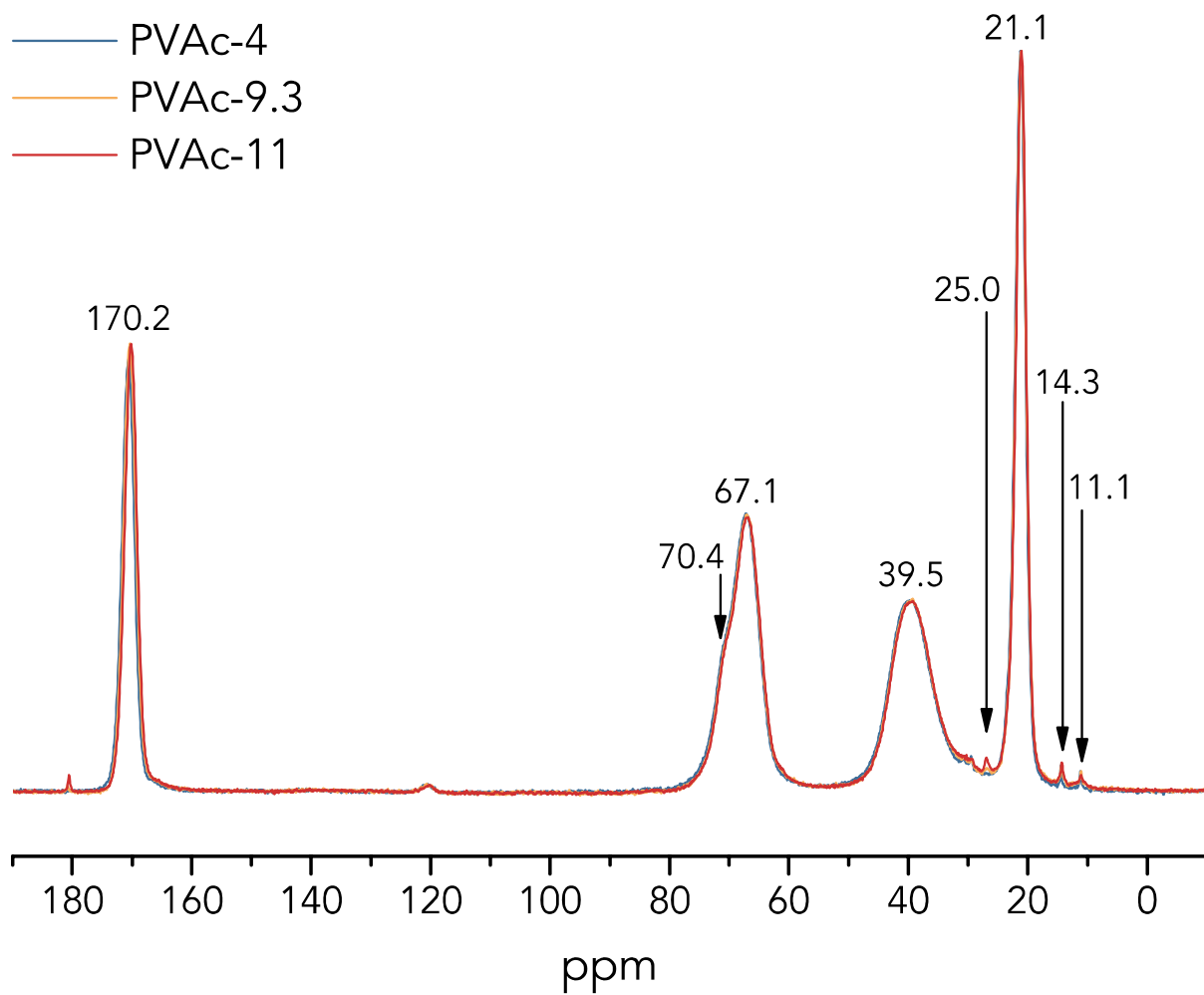


**Fig. S1** 400.21 MHz  $^1\text{H}$  NMR spectra of PVAc-4 (a), PVAc-9.3 (b) and PVAc-11 (c) dissolved in  $\text{DMSO-}d_6$  at 40 °C. Resonance lines in the ranges A and B were assigned to the acetate protons and the methylene protons, respectively, in the partially hydrolyzed PVAc. The hydrolysis degrees of the samples were calculated according to the equation:

$$\text{Hydrolysis degree (\%)} = 100 - \frac{\text{acetate protons (A)}}{3} \bigg/ \frac{\text{methylene protons (B)}}{2}$$



**Fig. S2** 100.64 MHz  $^{13}\text{C}$  NMR spectra of PVAc-4 (**a**), PVAc-9.3 (**b**) and PVAc-11 (**c**) dissolved in  $\text{DMSO-}d_6$  at 40 °C. Resonance lines of  $-\text{CH}_3$ ,  $-\text{CH}_2$ ,  $-\text{CHO}$  and  $-\text{COO}$  carbons in the partially hydrolyzed PVAc are located in the positions A, B, C and D, respectively.



**Fig. S3** Solid-state 100.64  $^{13}\text{C}$  CP-MAS NMR spectra of the native PVAc samples prepared in different pH conditions.

**Table S1** Toughness of all samples characterized by tensile testing in this study.

Sample coding	Toughness (J/m <sup>3</sup> )
PVAc-4	$1.96 \times 10^7$
X0.5PVAc-4	$2.05 \times 10^7$
X1PVAc-4	$1.64 \times 10^7$
X1.5PVAc-4	$1.28 \times 10^7$
X2PVAc-4	$0.82 \times 10^7$
X3PVAc-4	$1.31 \times 10^7$
PVAc-9.3	$1.75 \times 10^7$
X0.5PVAc-9.3	$1.82 \times 10^7$
X1PVAc-9.3	$1.15 \times 10^7$
X1.5PVAc-9.3	$1.40 \times 10^7$
X2PVAc-9.3	$1.63 \times 10^7$
X3PVAc-9.3	$2.19 \times 10^7$
PVAc-11	$1.61 \times 10^7$
X0.5PVAc-11	$1.47 \times 10^7$
X1PVAc-11	$1.44 \times 10^7$
X1.5PVAc-11	$1.34 \times 10^7$
X2PVAc-11	$0.21 \times 10^7$
X3PVAc-11	$0.36 \times 10^7$