Supporting information

Trimethylol melamine functionalized polyvinyl alcohol network for high performance nano-silicon anode

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Keywords: Lithium ion battereis; nano-silicon anode; polyvinyl alcohol; trimethylol melamine; functionalization

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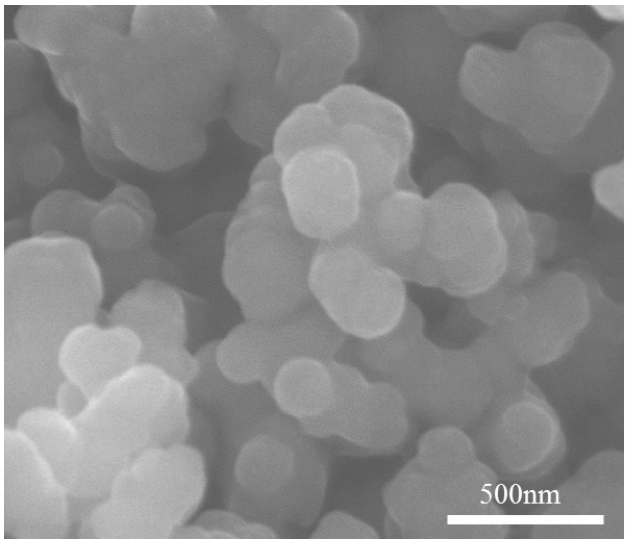

Fig. S1 SEM image of the Si particles adopted in this study.

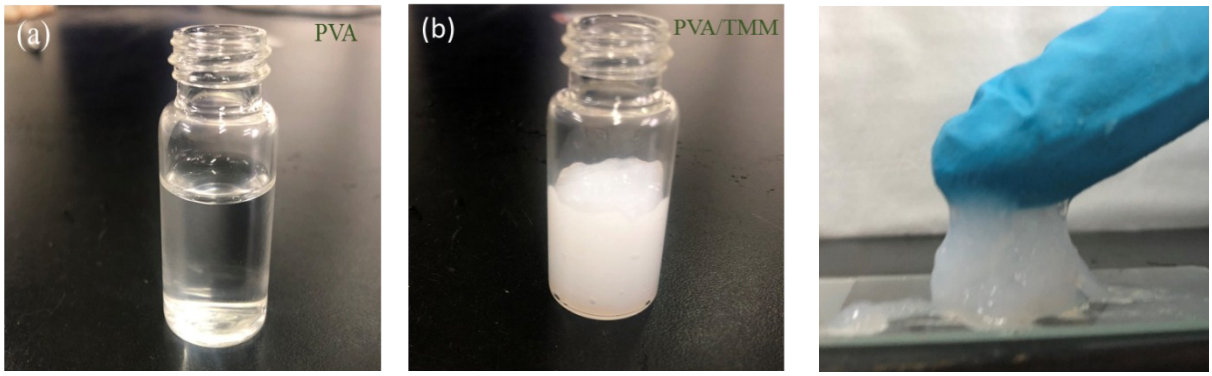

Fig. S2 The photographs of the pure PVA solution and the cross-linked PVA gel at 0.08 molar fraction of TMM.

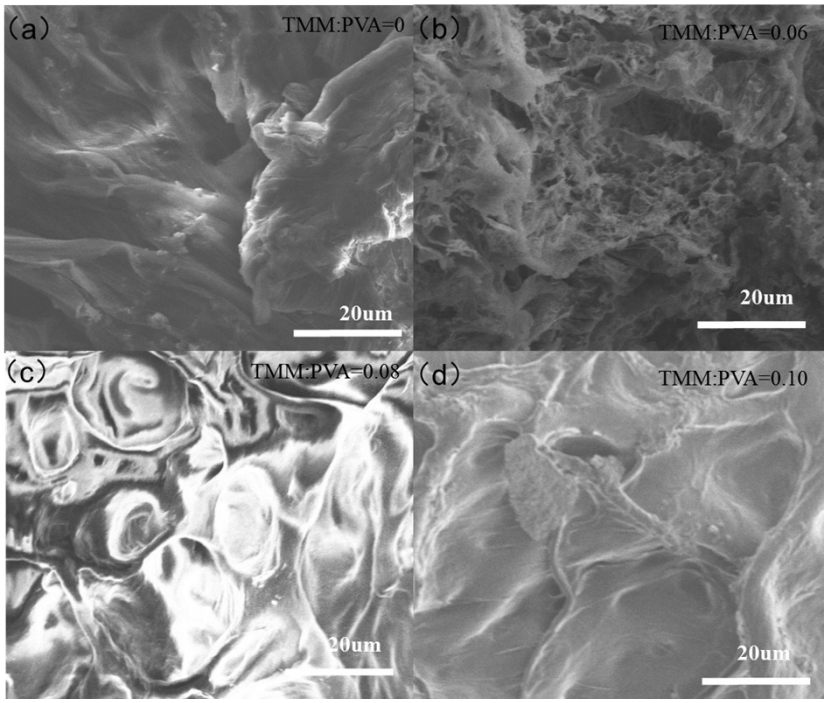

Fig.S3 SEM images of pure PVA film and the TMM cross-linked PVA film at different molar fractions.

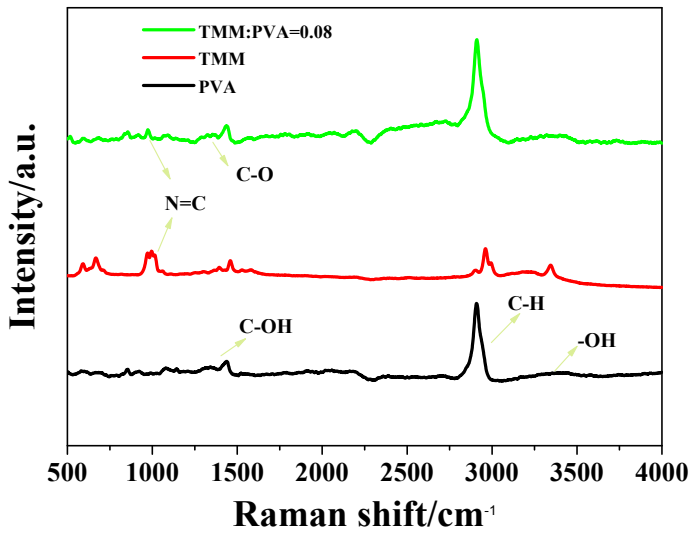

Fig. S4 Raman spectrum for pure PVA ,crosslinking agent TMM and the TMM functionalized PVA at 0.08 molar fraction.

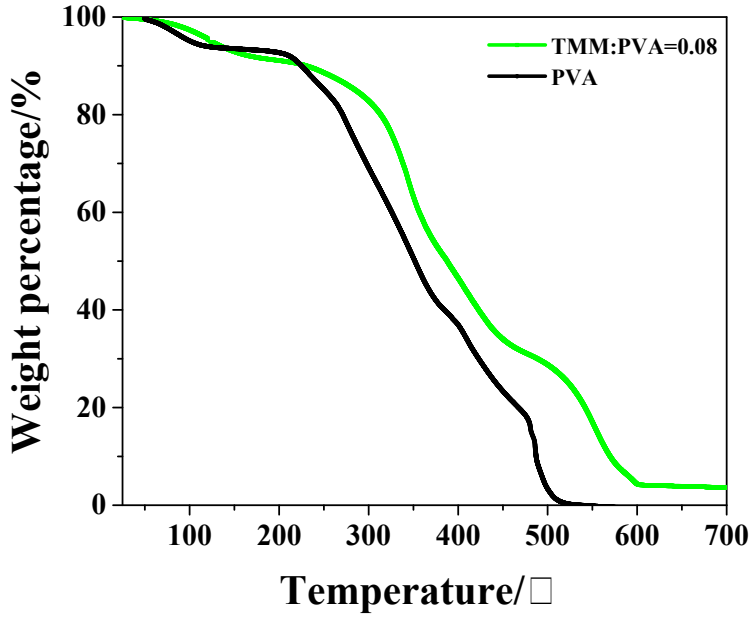

Fig. S5 TG diagram for pure PVA and the TMM functionalized PVA at 0.08 molar fraction.

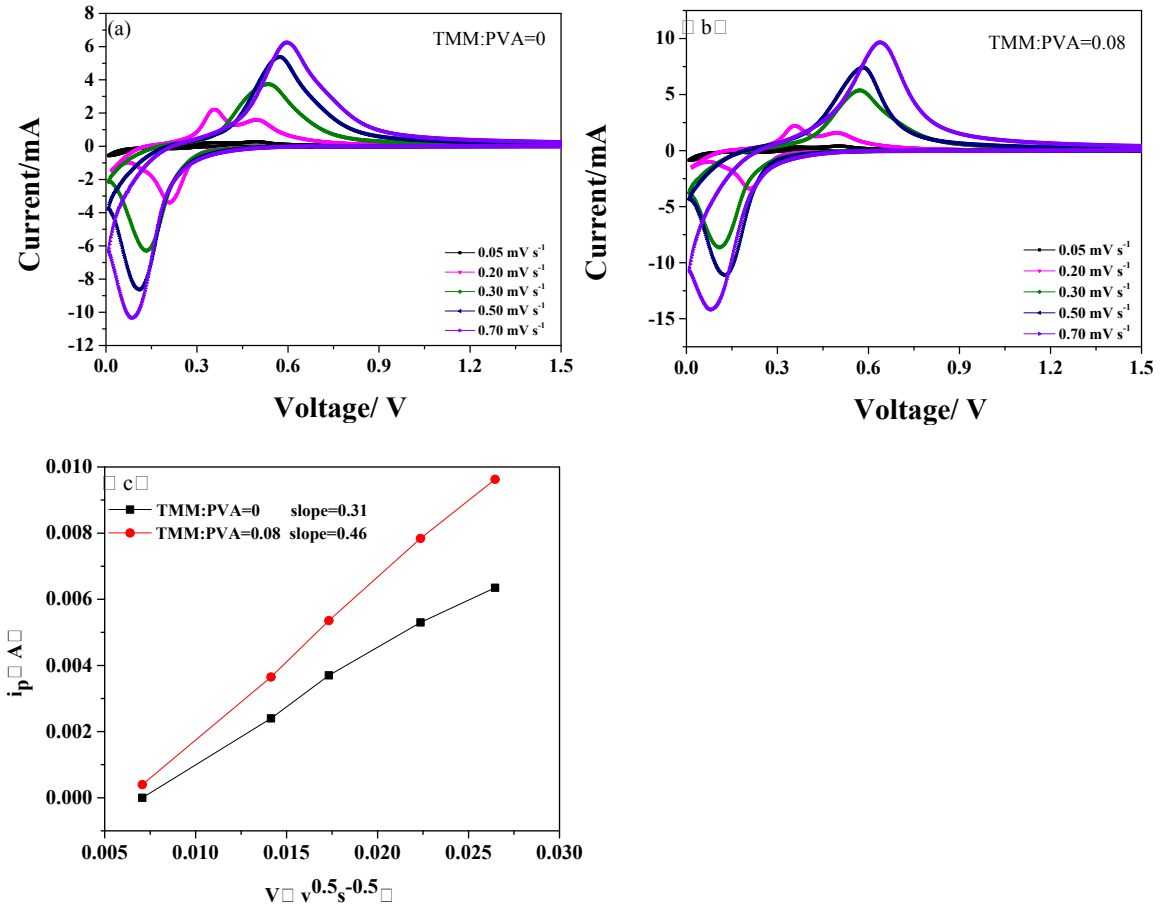

Fig. S6. The cyclic voltammetry (CV) curves of the Si electrodes using PVA binder (a) without and (b) with 0.08 molar fraction of TMM cross-linker at different scan rates and (c) the fit between square root of scan rate and anodic peak current.

Randles-Sevcik equation

$I_p=6.25 \cdot 10^5 n^{3/2} A D^{1/2} U^{1/2} C$

It is seen that the peak current is in linear relationship with the square root of scan rate, and the slope of the straight line is the diffusion coefficient of the lithium ion of the lithium ion battery. The high slope reveals large Li diffusion coefficient.

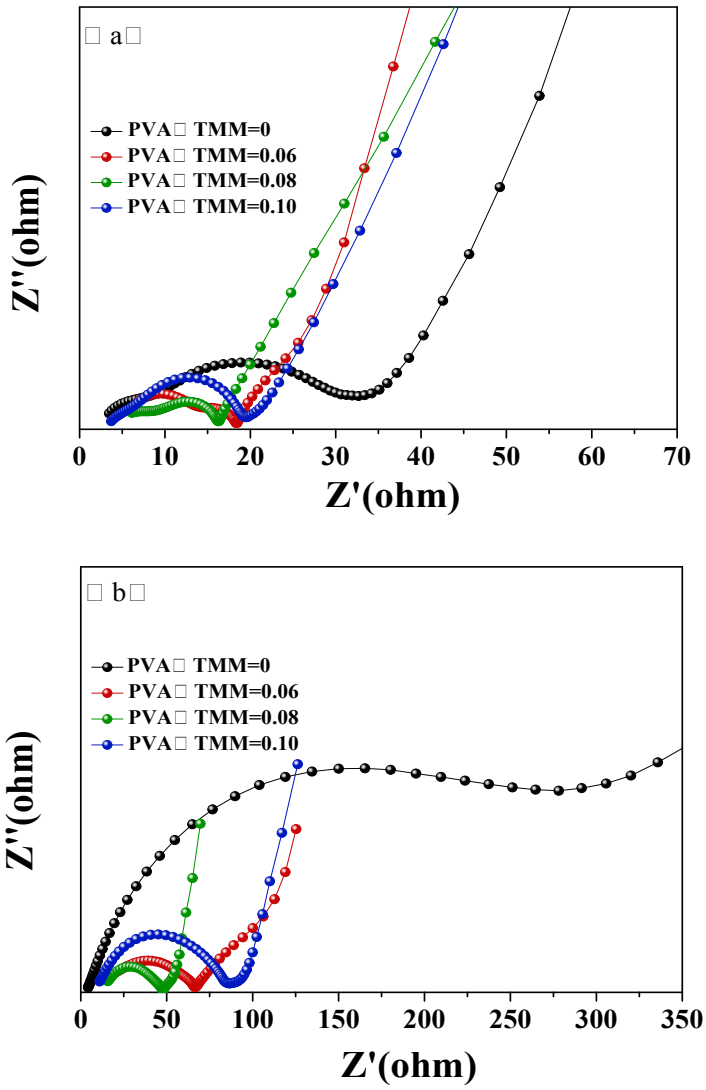

Fig. S7 Nyquist plots for of the Si electrodes using PVA binder at different TMM molar fractiona (a) after rate test and (b) after 500 charge-discharge cycles.