

New covalent bonded polymer-calcium silicate hydrate composites

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Supplementary material (ESI) for Journal of Materials Chemistry :
 ^1H and ^{13}C NMR spectra of the polymers ; Determination of the polymer content
in the composites from thermogravimetric analysis.

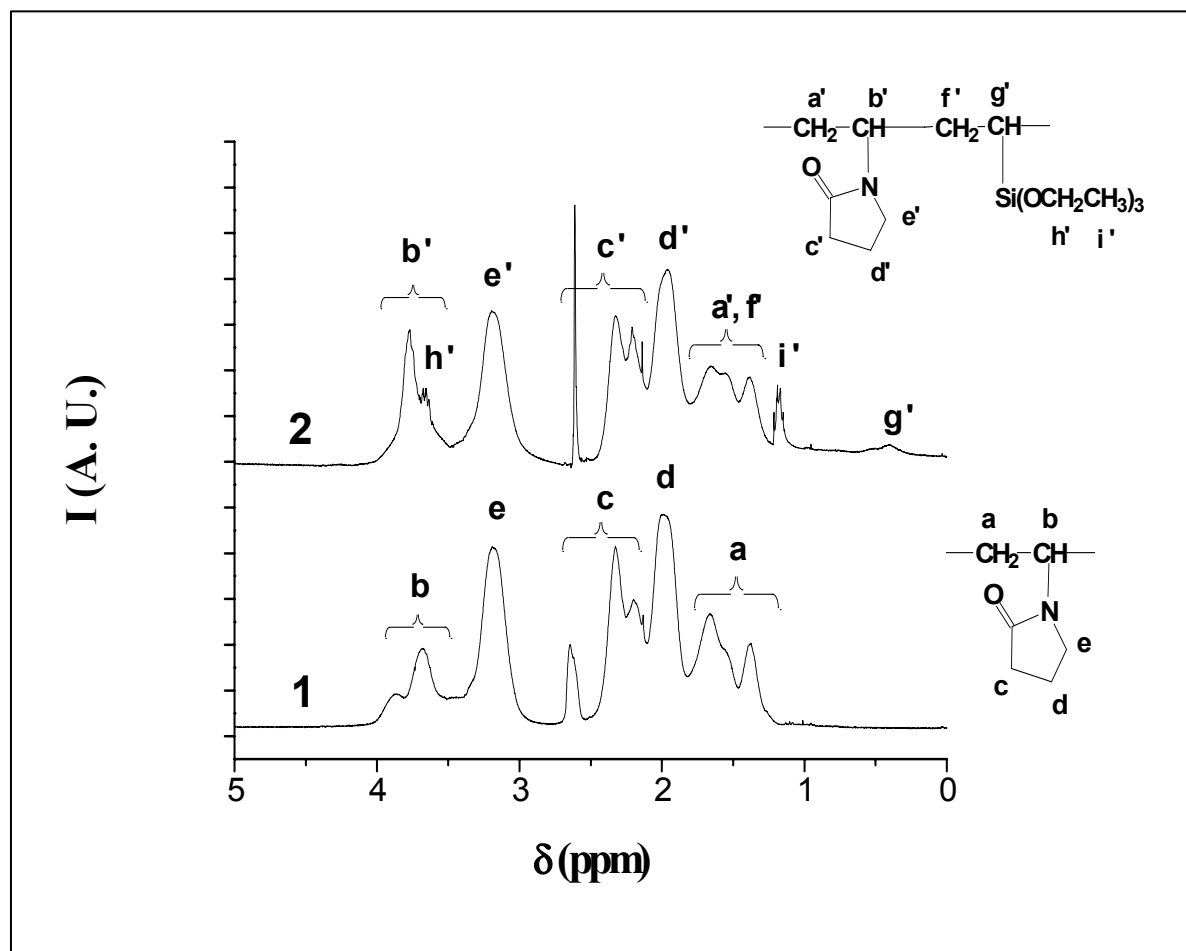


Figure S1 : ^1H NMR spectra of polymers : 1 = PVP-T0 ; 2 = PVP-T9

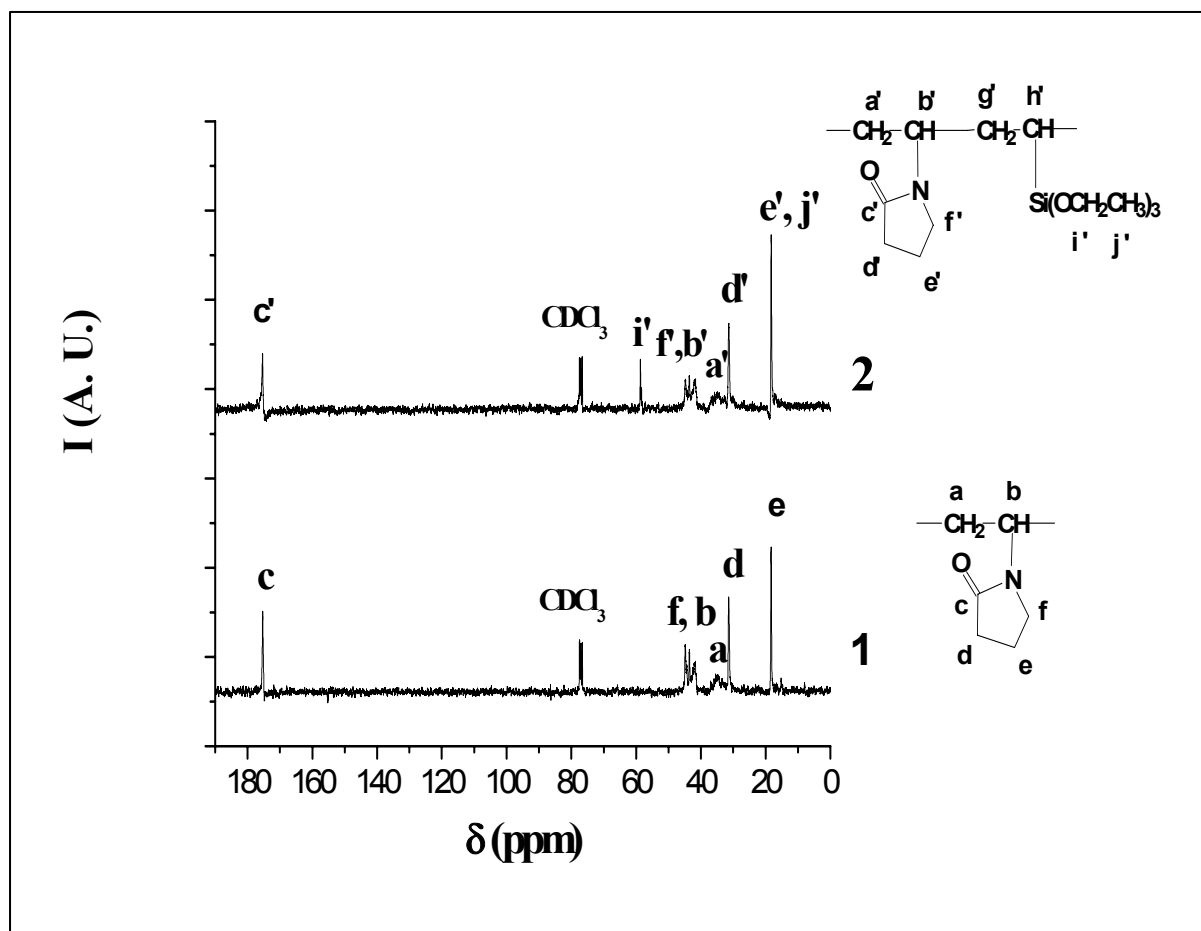


Figure S2 : ^{13}C NMR spectra of polymers : 1= PVP-T0 ; 2= PVP-T9

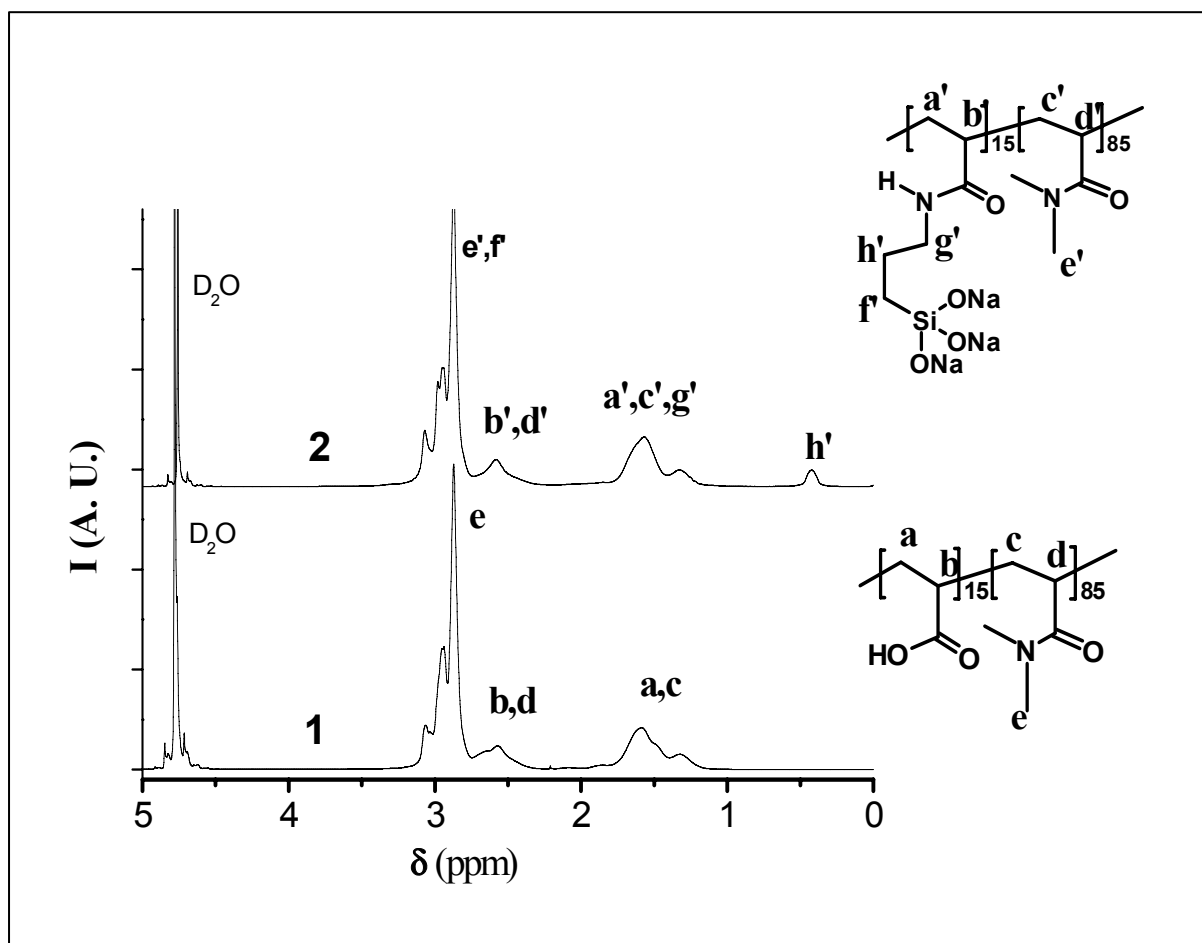


Figure S3: ^1H NMR spectra of polymers : 1=PDMA-AA ; 2= PDMA-T15-D0

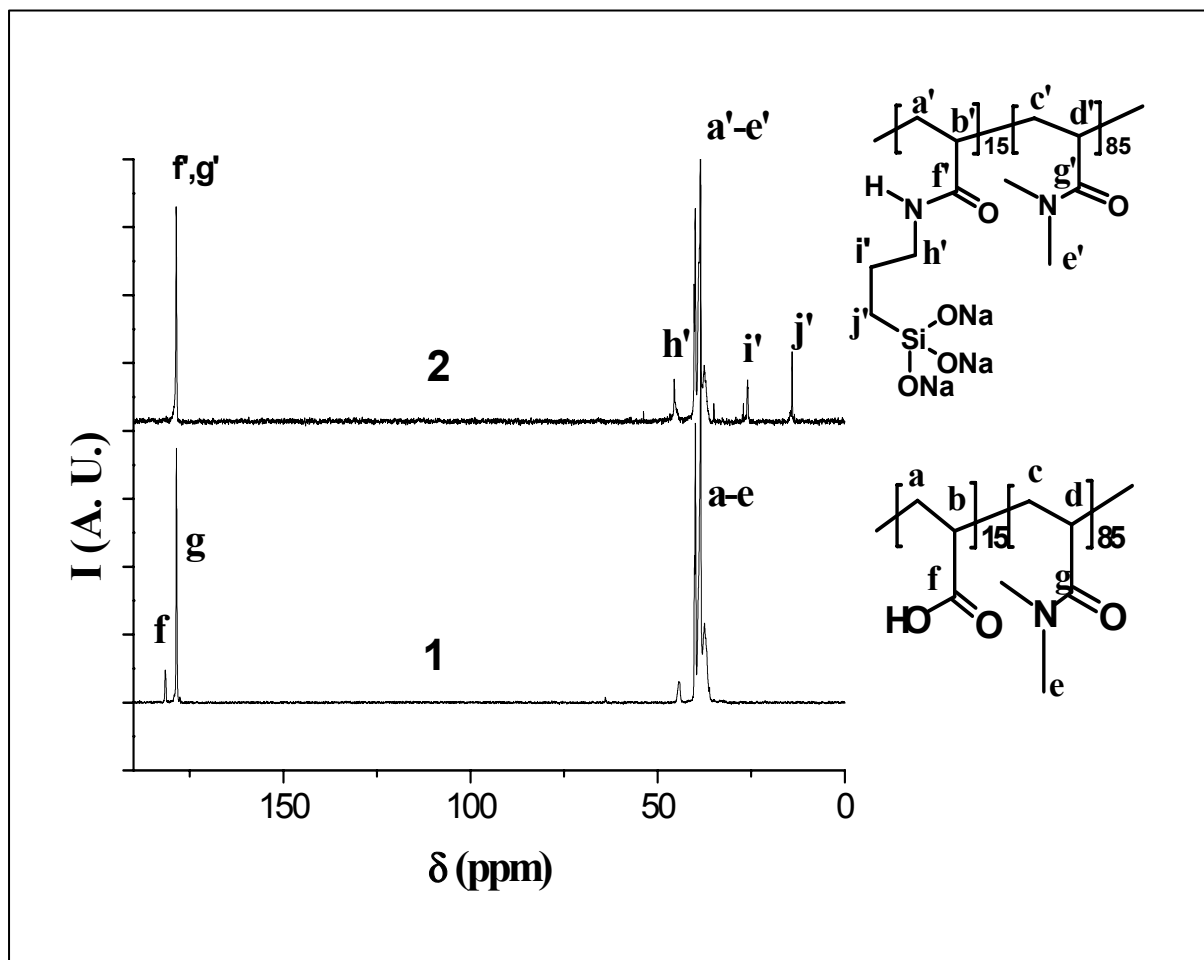


Figure S4: ^{13}C NMR spectra of polymers : 1=PDMA-AA ; 2=PDMA-T15-D0

Determination of the polymer content in the composites from thermogravimetric analysis.

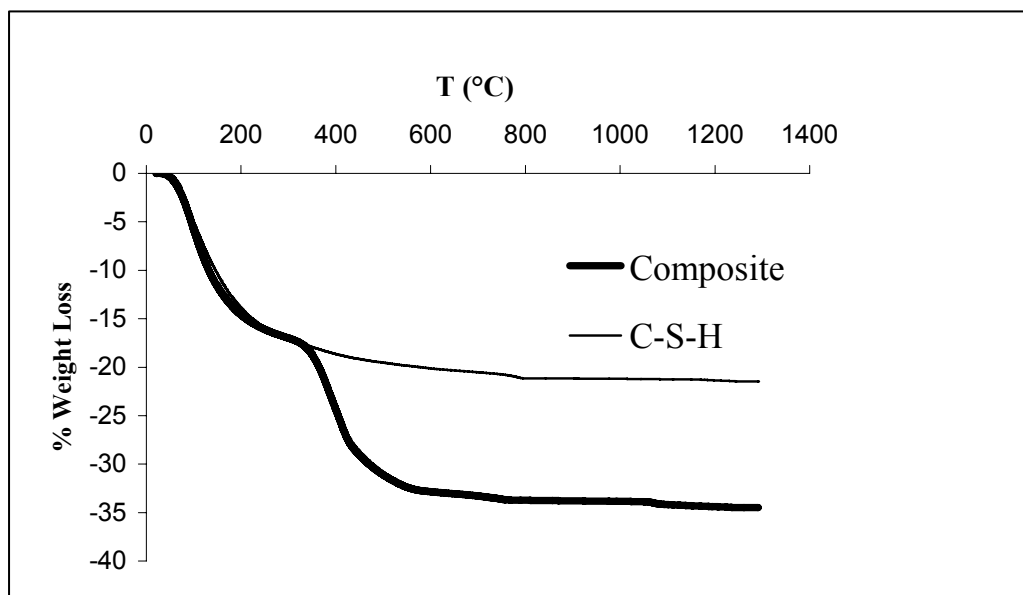


Figure S5 : typical thermogram of a pure C-S-H sample and of a composite sample

The exothermic weight loss between 300 and 640°C ($\%(300-640^{\circ}\text{C})$) in the composite is attributed to the polymer combustion and to desorption of small amount of water. In pure inorganic C-S-H, the weight loss between 300 and 640°C ($\%(300-640^{\circ}\text{C in C-S-H})$) (about 5%) is only attributed to desorption of small amount of water. Therefore, the percentage of organic is given by the difference $\%(300-640^{\circ}\text{C}) - \%(300-640^{\circ}\text{C in C-S-H})$.

For all materials, the weight loss under 250°C (generally 10-15%) and above 640°C (less than 1%) are respectively attributed to desorption of physisorbed water and decarbonation of CaCO_3 . Above 850°C, no additional weight loss is observed and there only remains anhydrous calcium silicate. The percentage of anhydrous calcium silicate is given by the relation $100 - \%(25-850^{\circ}\text{C})$, where $\%(25-850^{\circ}\text{C})$ represents the total weight loss. The polymer

content in the composite with respect to anhydrous calcium silicate ($m_p/(m_{Si}+m_{Ca})$) is therefore obtained by the following equation :

$$m_p/(m_{Si}+m_{Ca}) = [(\% (300-640^\circ\text{C}) - \% (300-640^\circ\text{C in C-S-H})) \times 100] / [100 - \% (25-850^\circ\text{C})]$$