Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

Poly(vinylpyrrolidone) stabilized aluminium nanoparticles obtained from the reaction of $SiCl_4$ with $LiAlH_4$

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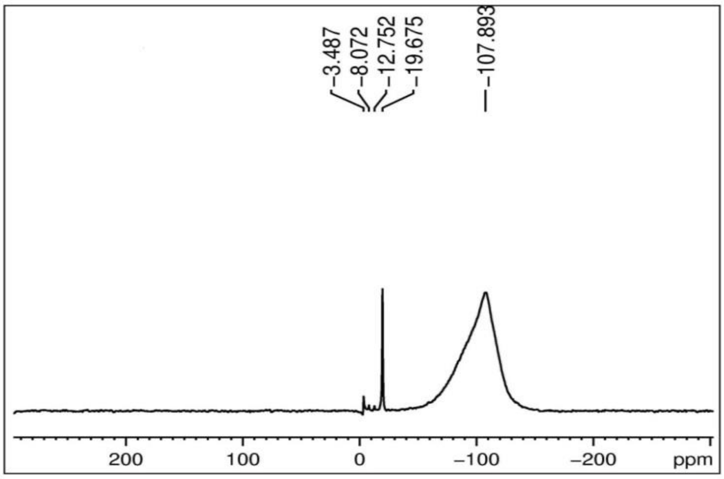

Fig. S1 ^{29}Si NMR spectrum of the reaction mixture (the peak at δ -107.89 ppm is for glass)

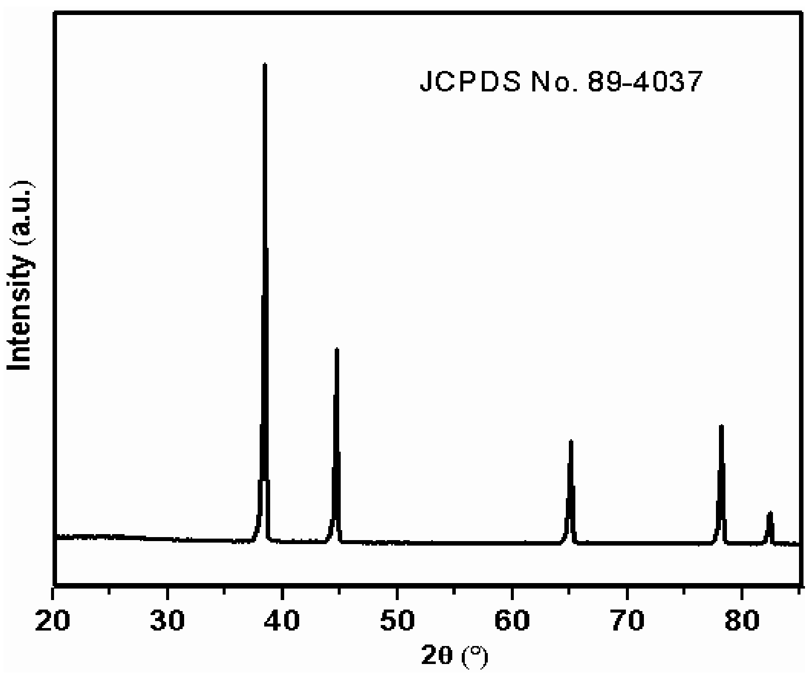

Fig. S2 PXRD spectrum of aluminium without polymer

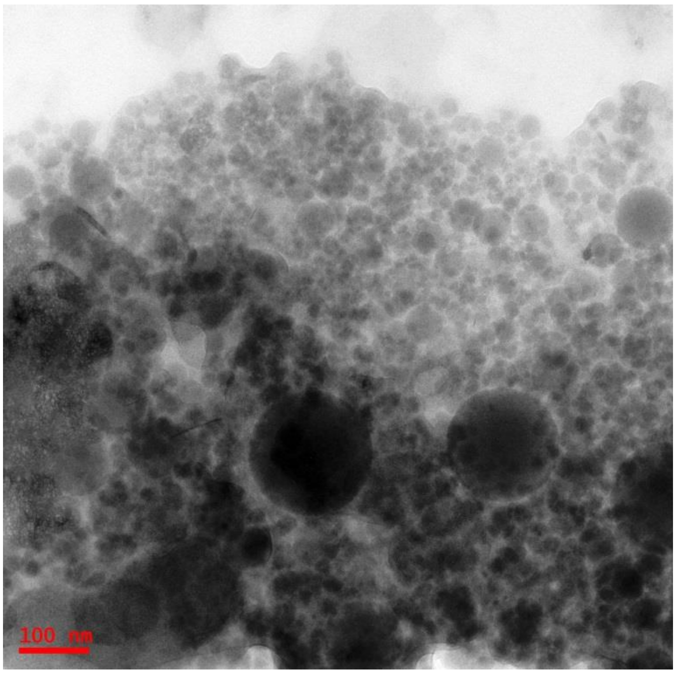

Fig. S3 TEM image of aluminium without polymer

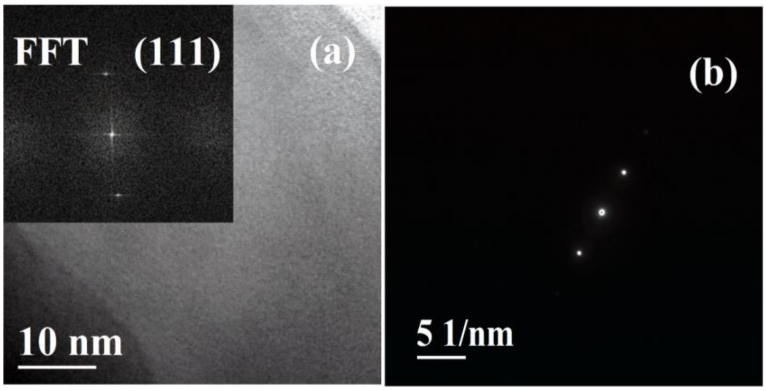

Fig. S4: (a) HRTEM image of bare Al with inset FFT and (b) Corresponding SAED pattern.

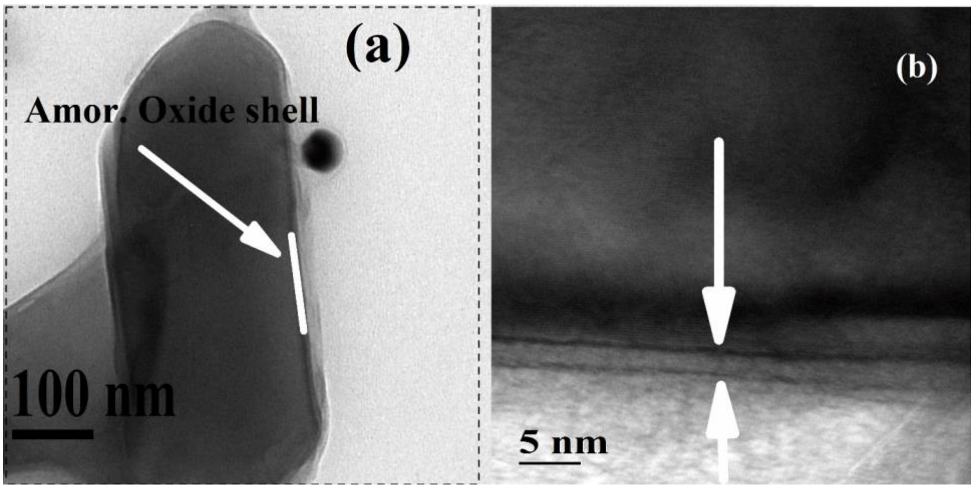

Fig. S5: Bright field TEM images of bare Al particles (a) showing oxide layer on the surface and (b) Corresponding HRTEM.

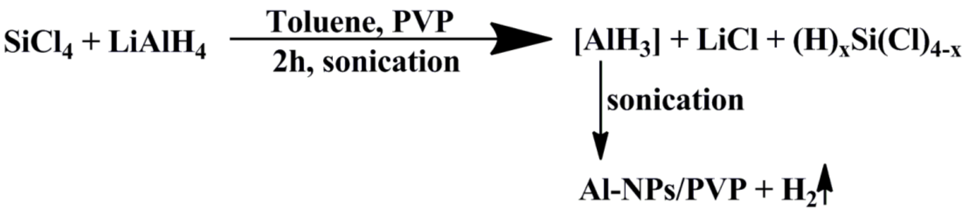

Fig.S6: Mechanism of formation of Al-PVP nanocomposite

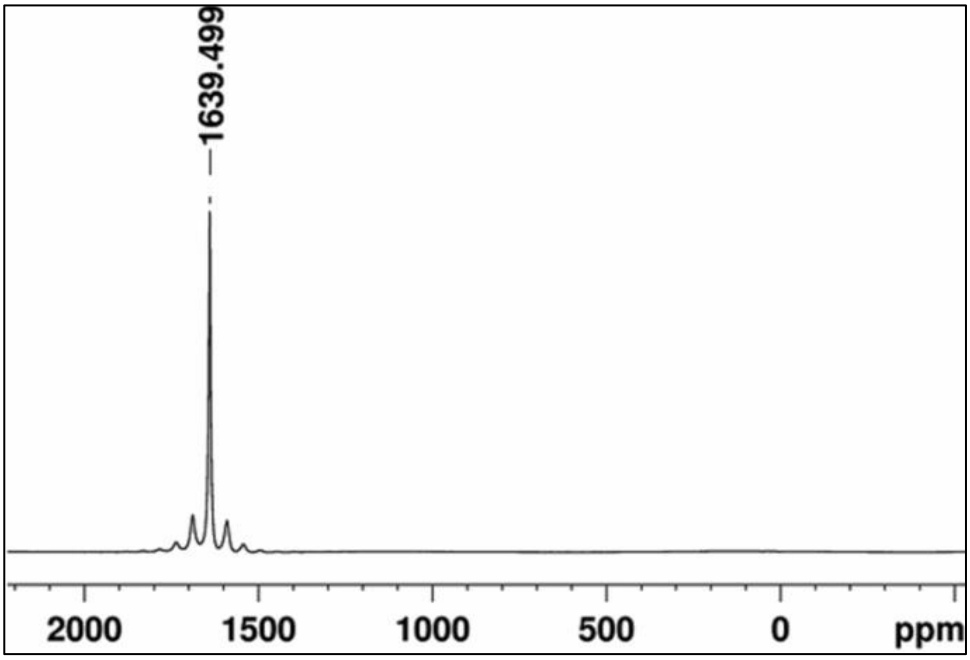

Fig. S7 ^{27}Al MAS NMR spectra of Al-PVP nanocomposite

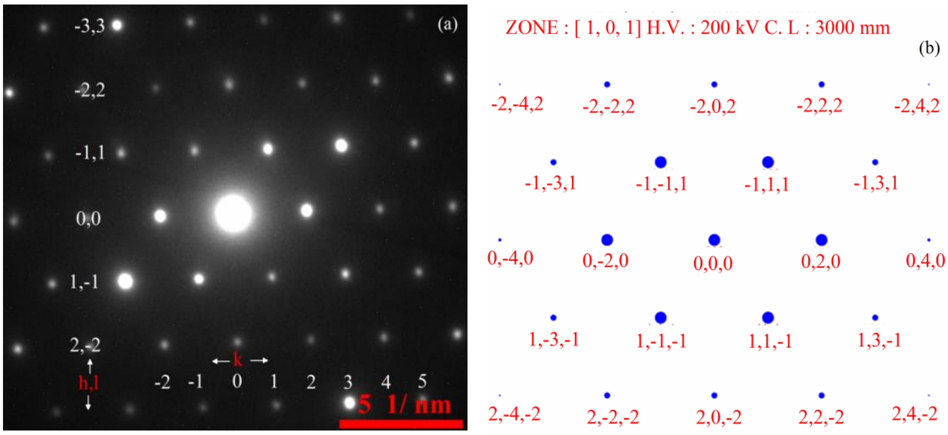

Fig. S8. **(**a) Selected area electron diffraction pattern of Al-PVP composite nanocrystal indexed based on (b) Al simulated diffraction pattern using Web-based Electron Microscopy application software: web- EMAPS.[1]

1. J. M. Zuo, J. C. Mabon and Web-based Electron Microscopy Application Software: Web-EMAPS, Microsc Microanal 10(Suppl 2), 2004.

Available online: http://emaps.mrl.uiuc.edu/

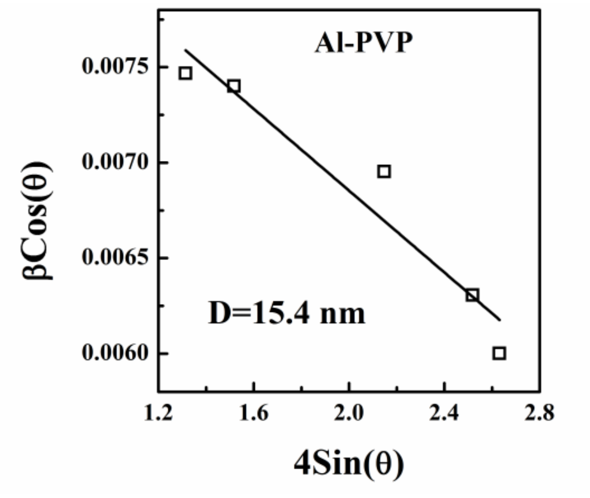

Fig. S9 Computed Williamson-Hall plot of Al-PVP composite

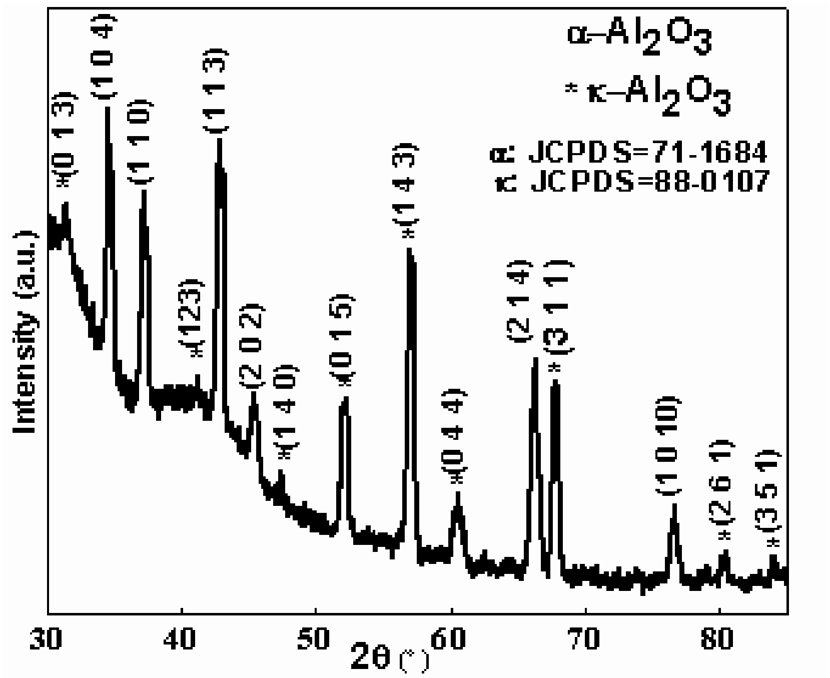

Fig. S10: PXRD pattern of Al-PVP nanocomposite obtained after thermal analysis revealing the growth of alumina phases.

OXIDATION OF ALUMINIUM NANOPARTICLES

When aluminium nanoparticle reacting with oxygen it will form Al_2O_3 and increases mass of aluminium. (L.Chen, W. Song, J. Lv, X. Chen and C. Xie, Materials Chemistry and Physics, 2010, 120, 670-675.)

$$4Al + 3O_2 \longrightarrow 2Al_2O_3$$

Liang Chen et.al calculated active aluminium in aluminium nanoparticles by using the equation below

$$m_{Al} = \frac{4}{3} \times \frac{M_{Al}}{M_{O_2}} m_{O_2} = 1.125 m_{O_2}$$

m_{Al} = mass of the aluminium nanoparticles reacted in oxidation

M_{Al} = formula weight of Al

M_{O_2} = formula weight of O_2

m_{O_2} = Δm (mass gain form TG), m_{O_2} = mass of the reacted O_2

Accordingly, since we have seen 56.03 % weight gain in TG it will give active Al as 63.03 %

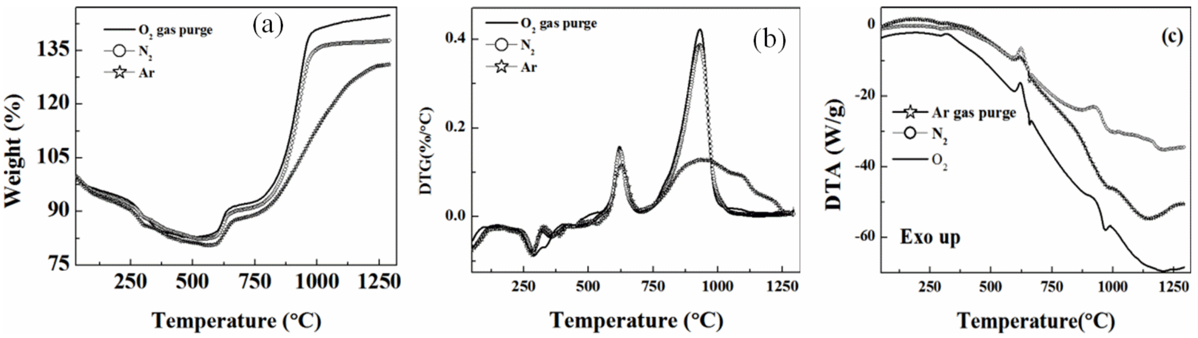

Fig. S11: TG-DTG-DTA plots of Al-PVP composite showing two stage of oxidation (experiment under oxygen, nitrogen and argon)

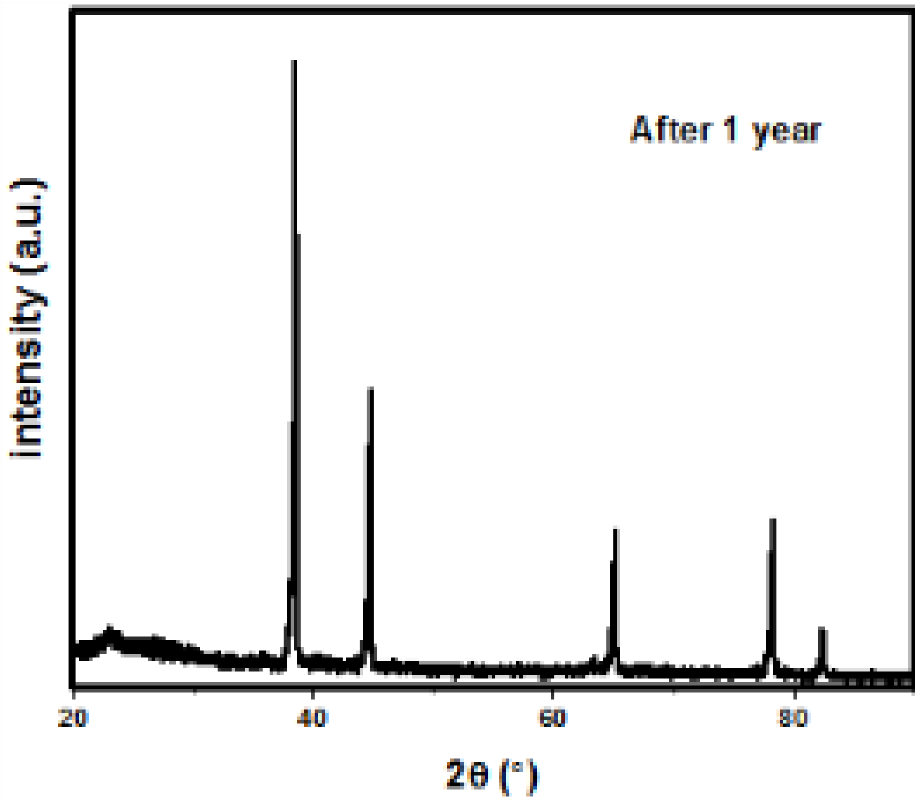

Fig. S12: PXRD spectrum of Al-PVP composite after one year.

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