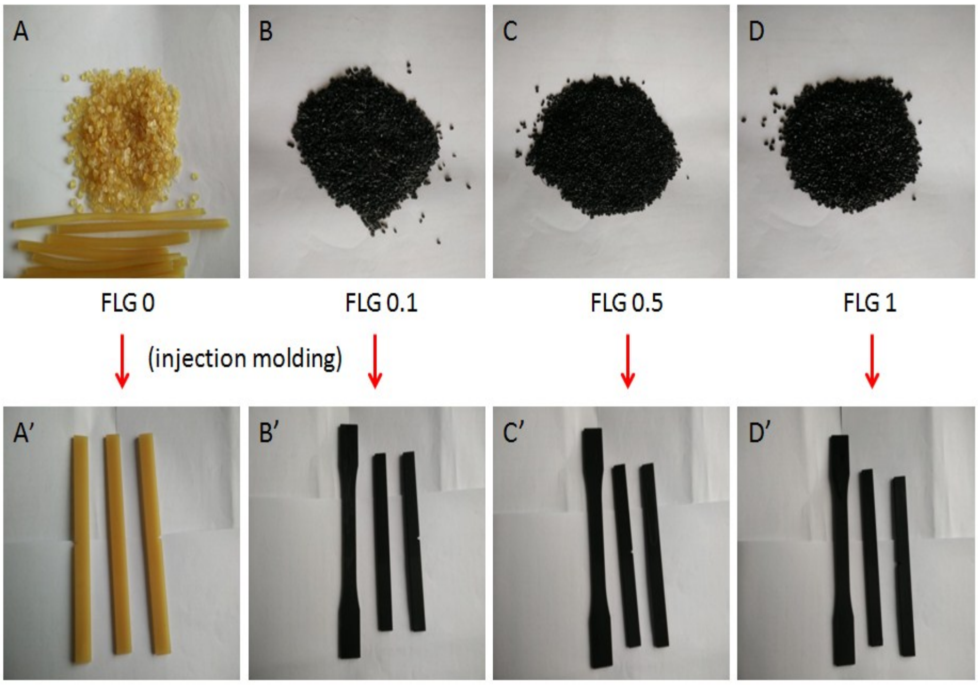

Fig. S1- The samples of pure PA6 and FLG/PA6 composites with various content of FLG prepared by solid reactive extrusion in this work (A-D); A'-D' are the injection molding samples of A-D, respectively.

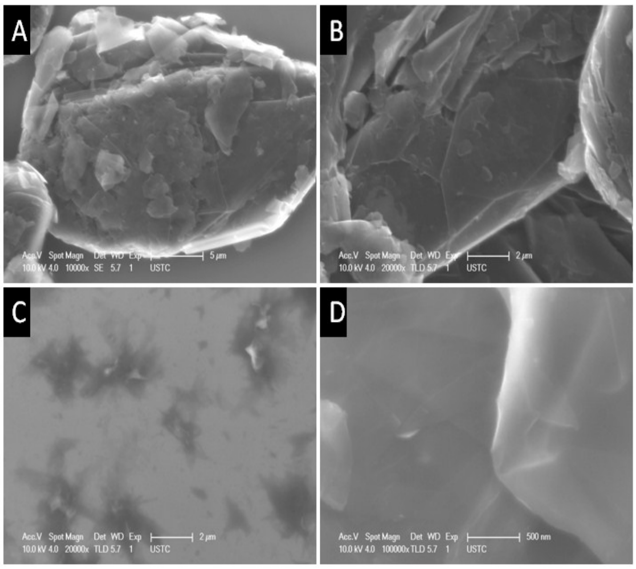

Fig.S2-The FE-SEM images: (A) and (B) are the images of graphite powder; (C) and (D) are the images of few-layer graphene powder.

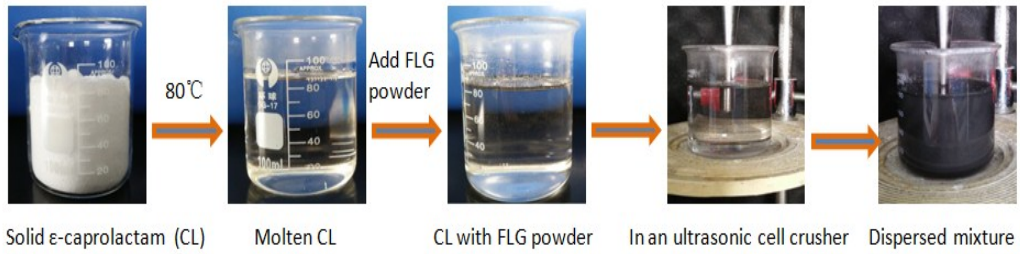

Fig. S3- The dispersion process of FLG in ε-caprolactam.

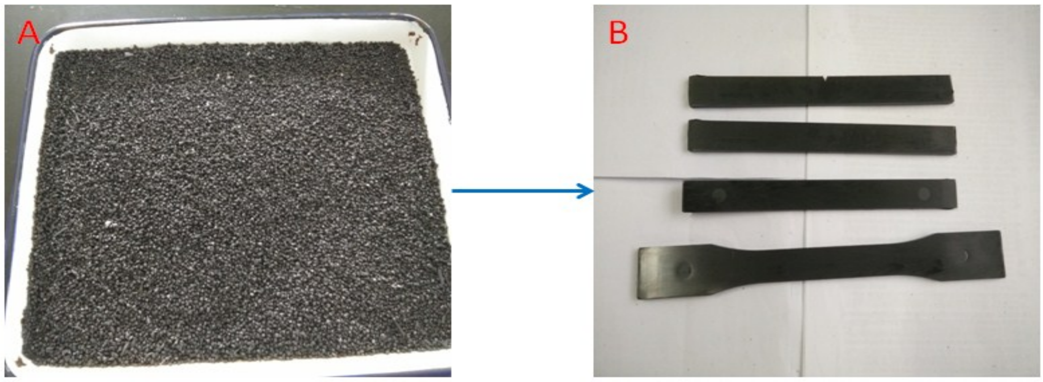

Fig. S4- The supplementary experiment to prepare FLG/PA6 composite with 3 wt% FLG by liquid reactive extrusion: (A) the master batches of composite; (B) the mechanical test samples from injection molding.

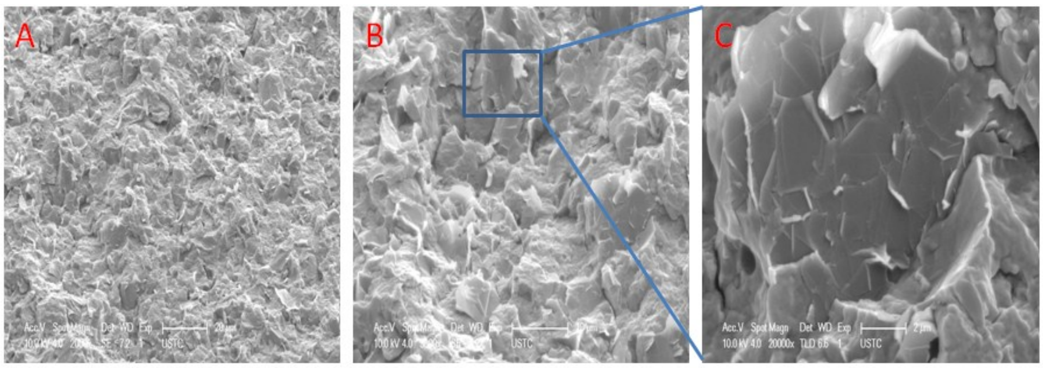

Fig. S5- FE-SEM images of FLG/PA6 samples with 3 wt% FLG content: (A) the dimension is 20μm; (B) the dimension is 10μm and (C) is the amplification of (B).

As can be seen from Fig. S5, the FE-SEM images show a relative good dispersion on the large dimension of 20μm, but each of the dispersion unit is the aggregation of the FLG sheets (Fig. S5-C) because of the Van der Waals' force between the FLG sheets when the graphene volume is high. Since the Van der Waals' force is much weaker compared to the mechanical force, so, when the samples are subjected to the mechanical force like tensile and impact force, the FLG sheets of aggregations may separate very easy, and make the aggregations become the stress-points in the nanocomposites.