Supporting Information

MAX Phase Ternary Carbide Derived 2-D Ceramic Nanostructures [CDCN] as Chemically Interactive Functional Fillers for Damage Tolerant Epoxy Polymer Nanocomposites

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Results and Discussion

Rheological Analysis of epoxy composites

The interaction of Ti_3SiC_2 based CDCN is evident from the viscosity analysis of epoxy-Ti_3SiC_2 composites. The rheology curves prepared with nano Al_2O_3 and de-laminated Ti_3SiC_2 nano filler are presented in supporting Figure **S1**. The high surface area associated with nano Al_2O_3 produce agglomerates and thus high macroscopic viscosity, where as in Ti_3SiC_2 CDCN, the thin-sheet structure, its delamination during mechanical shear and stability as dispersed phase in resin suspension controls the viscosity.

Effect of Ti_3SiC_2 on Thermal stability

A weight gain is seen in composites after 550°C probably due to the oxidation of Ti_3SiC_2. The TG analysis of bare Ti_3SiC_2 shown in supporting figure [**S2]** clearly indicates the weight gain after 500°C.

Effect of Ti_3SiC_2 CDCN on the epoxy Mechanical Properties

SEM images show that the composite is free from processing defects like cavities, pits and air traps, supporting that CDCN is uniformly dispersed. Microstructures further shows that the composite undergoes ductile fractures. Presence of CDCN is seen on the vicinity of fractured surface **.**They also have firm interaction with the matrix and fracture occurred along the interface indicating the crack is deflected. A typical epoxy fracture in Al_2O_3 reinforced composite is also shown for better comparison in supporting figure S3

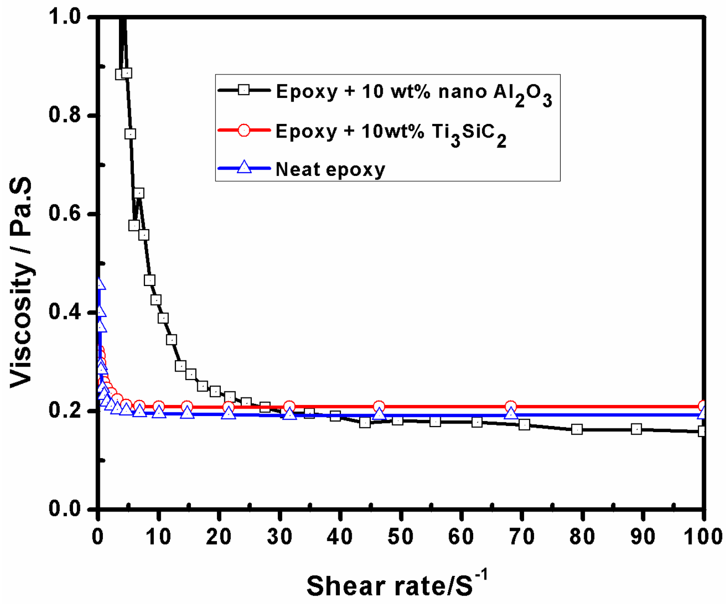

Fig. S1 Comparison of rheological properties of epoxy composites having 10 wt.% Ti_3SiC_2 with 10 wt.% of nano Al2O3 added epoxy composites.

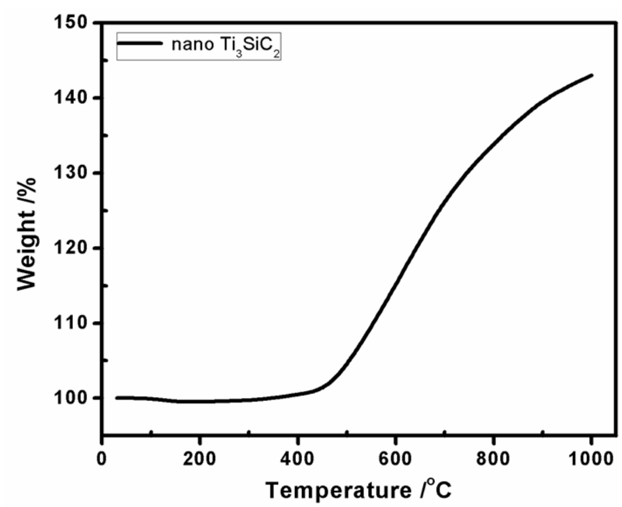

Fig. S2 TGA profile of bare Ti_3SiC_2

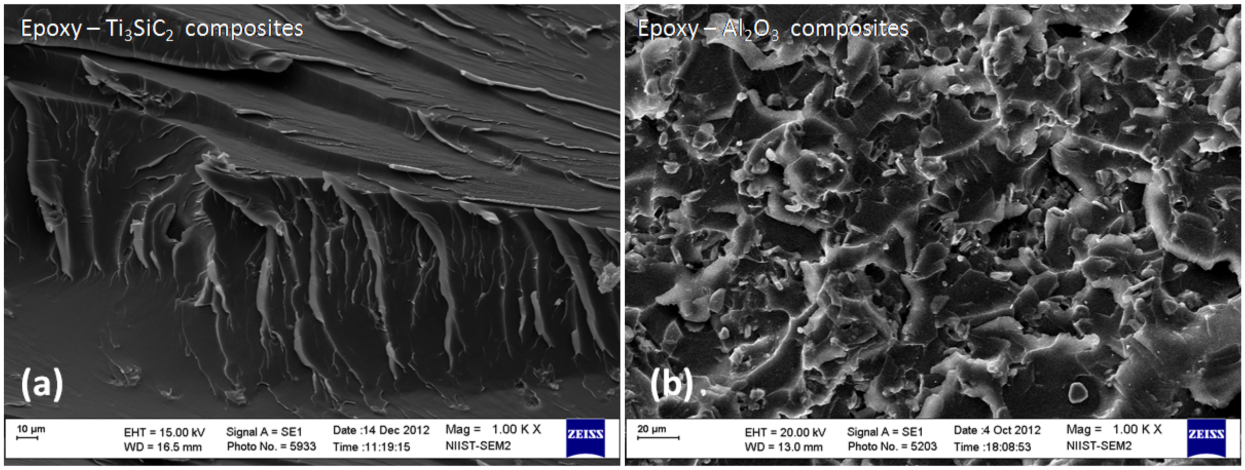

Figure S3 Comparison of fracture surfaces of a) epoxy-Ti_3SiC_2 composites and b) epoxy-Al_2O_3 Composites