

## Supplementary Material

# The Key Role of Tin (Sn) in Microstructure and Mechanical Properties of Ti<sub>2</sub>SnC (M<sub>2</sub>AX) Thin Nanocrystalline Films and Powdered Polycrystalline Samples

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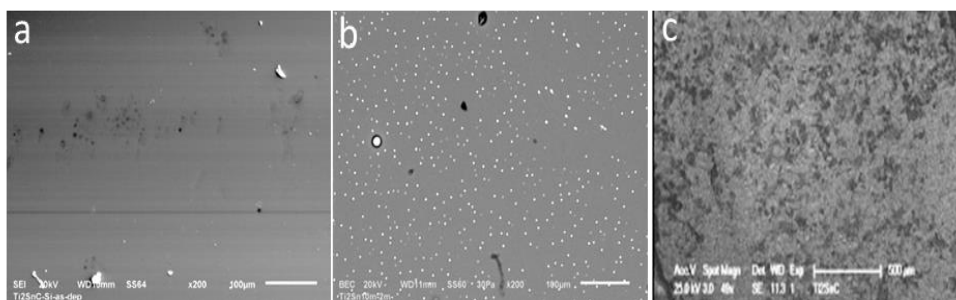
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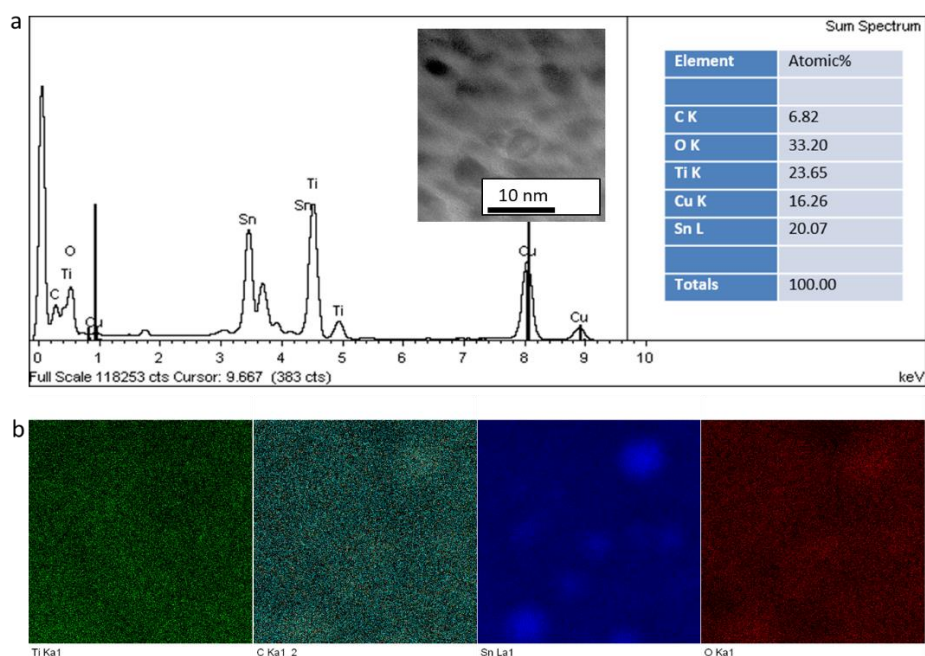
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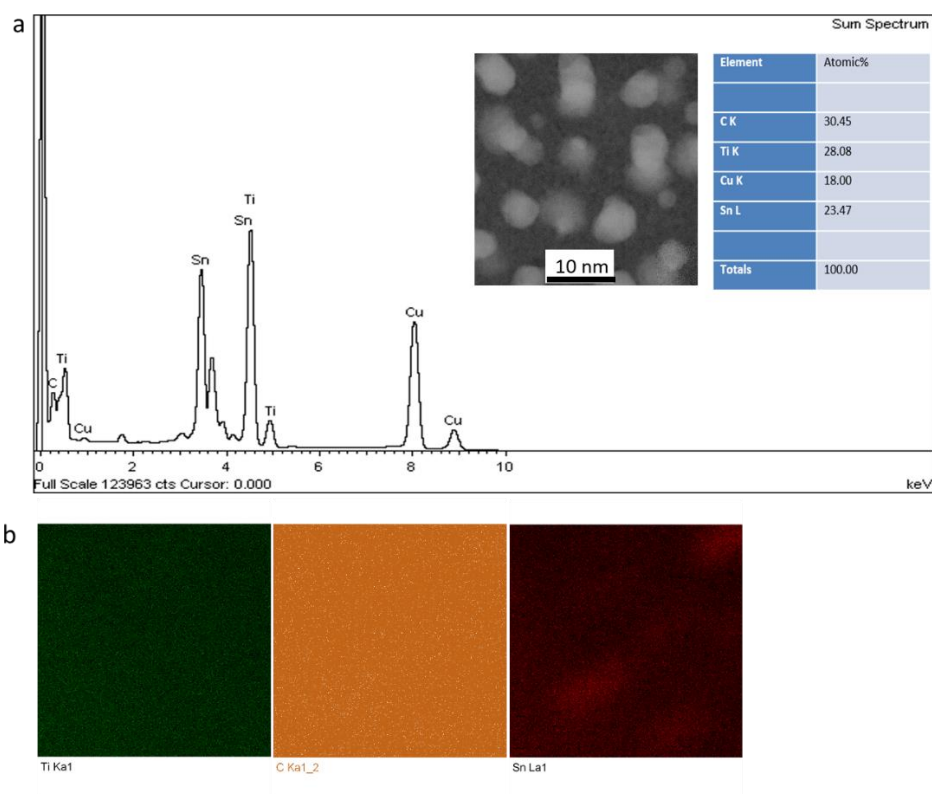
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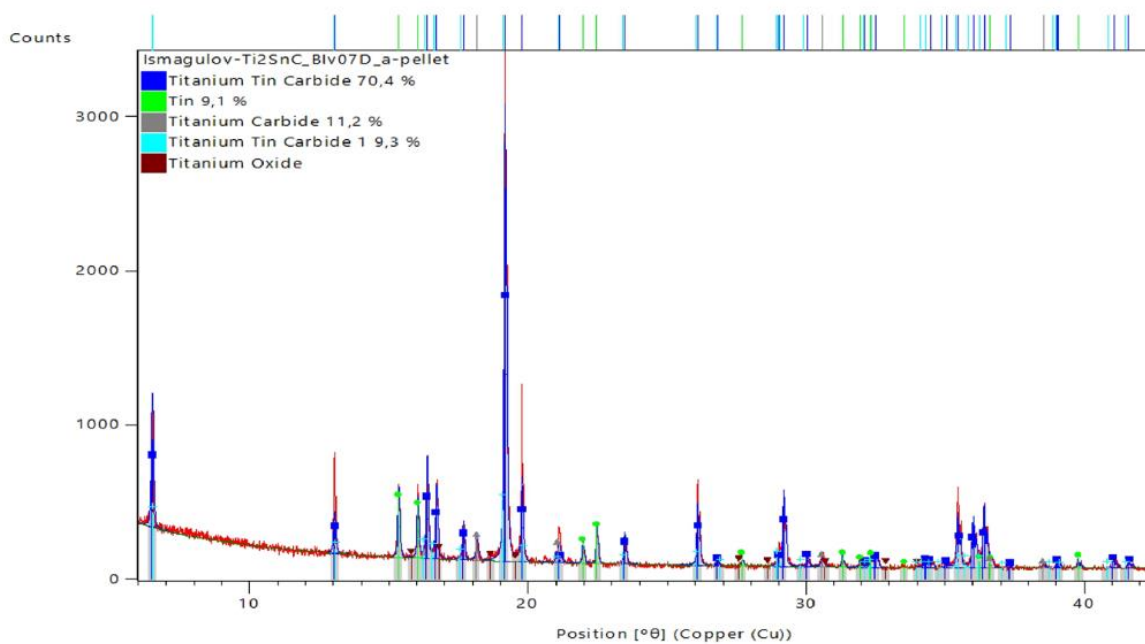
**Figure S1.** Morphology of  $\text{Ti}_2\text{SnC}$   $\text{M}_2\text{AX}$  samples (a)  $\text{Ti}_2\text{SnC\_AGTNCF}$ , (b)  $\text{Ti}_2\text{SnC\_Ar}^+\text{TNCF}$  and (c)  $\text{Ti}_2\text{SnC\_PPS}$  obtained by SEM with SE detector.



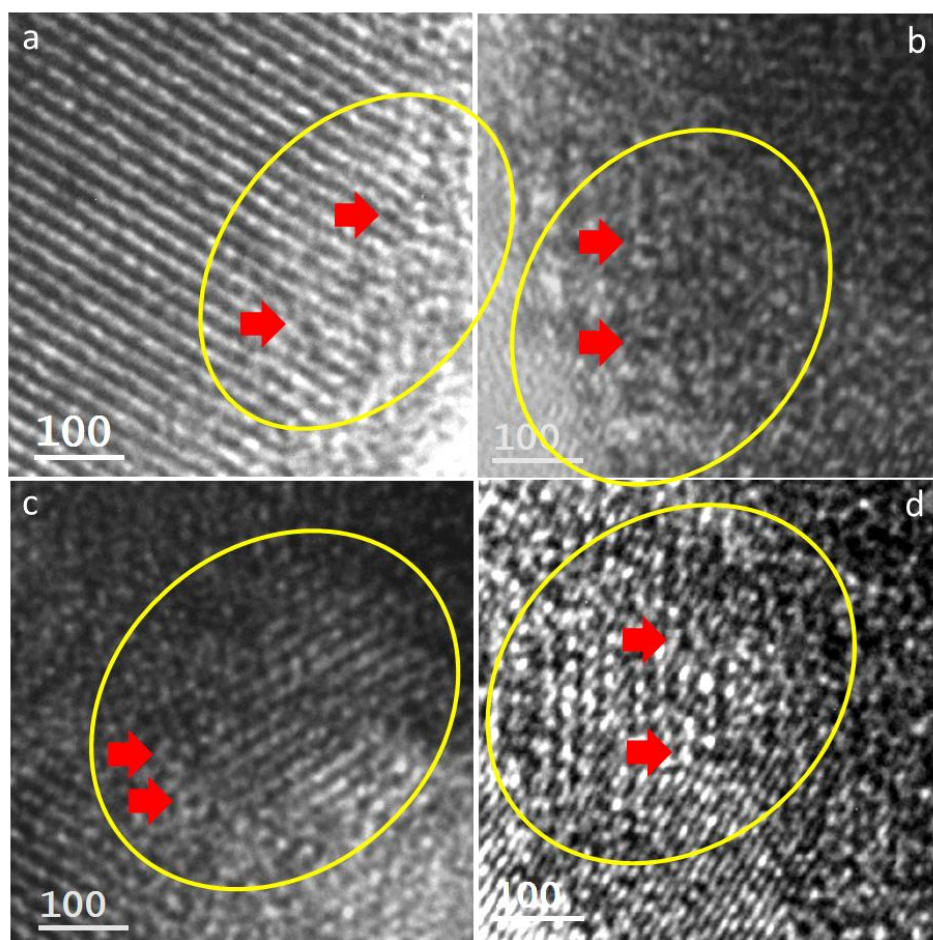
**Figure S2.** (a) EDS-STEM analysis and (b) EDS-STEM mapping  $\text{Ti}_2\text{SnC\_AGTNCF}$ . HAADF-STEM image of  $\text{Ti}_2\text{SnC\_AGTNCF}$  at low magnification and Table with at. % of elements are present as an inset in Figure S2a.



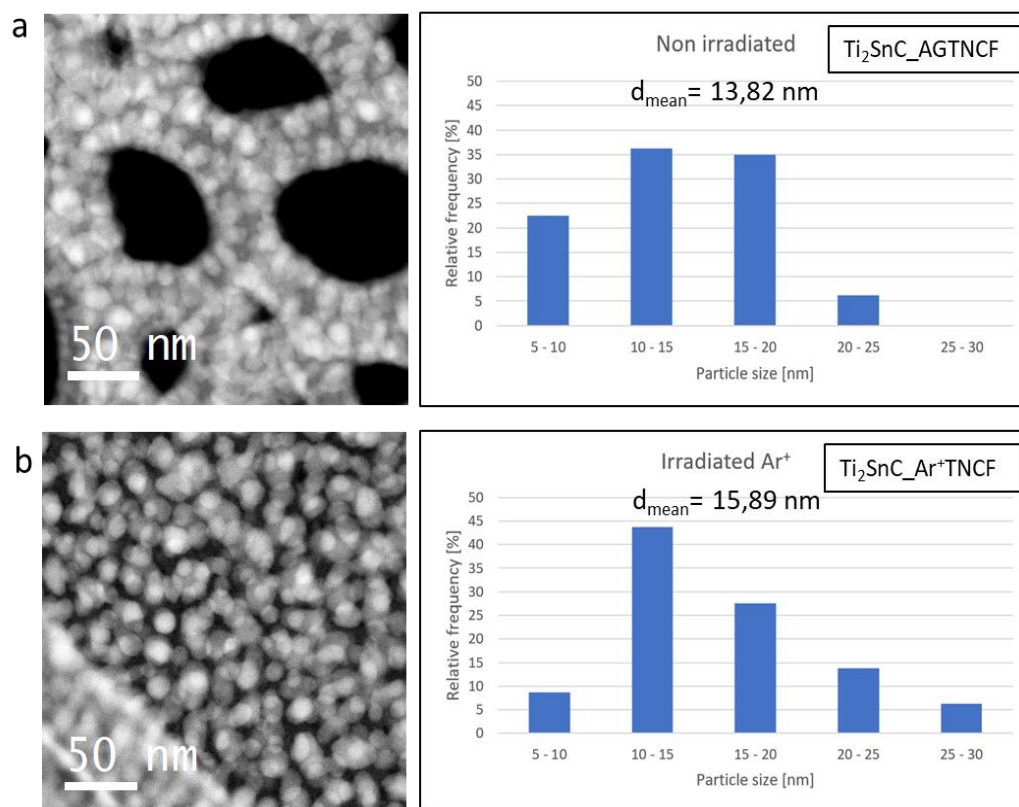
**Figure S3.** (a) EDS-STEM analysis and (b) EDS-STEM mapping  $\text{Ti}_2\text{SnC\_Ar}^+\text{TNCF}$ . HAADF-STEM image of  $\text{Ti}_2\text{SnC\_Ar}^+\text{TNCF}$  at low magnification and Table with at. % of elements are present as an inset in Figure S3a.



**Figure S4.** XRD pattern of  $\text{Ti}_2\text{SnC}$  PPS: Titanium Tin Carbide  $\text{Ti}_2\text{SnC}$  – 70.4% Reference code: 04-005-0037, Tin Sn – 9.1% Reference code: 04-004-7745, Titanium Carbide  $\text{TiC}_{0.55}$  – 11.2% Reference code: 04-018-5143, Titanium Tin Carbide  $\text{Ti}_2\text{SnC}$  – 9.3% Reference code: 04-005-0049.



**Figure S5. (a–d)** HRTEM images of irradiation-induced defect cores in Ti<sub>2</sub>SnC-Ar<sup>+</sup>TNCF. The yellow marked regions indicated defect cores in a different region of interest, where the interaction of dislocation lines, voids, and atoms segregated on the surface (marked with red arrows) are well visible.



**Figure S6.** STEM images and corresponding particle size distribution estimated by ImageJ software [1]. (a) Ti<sub>2</sub>SnC\_AGTNCF and (b) Ti<sub>2</sub>SnC\_Ar<sup>+</sup>TNCF

## References

1. Rueden, C.T.; Schindelin, J.; Hiner, M.C.; DeZonia, B.E.; Walter, A.E.; Arena, E.T.; Eliceiri, K.W. ImageJ2: ImageJ for the next generation of scientific image data. *BMC Bioinformatics*, **2017**, *18*, 529–533. [https://doi: 10.1186/s12859-017-1934-z](https://doi.org/10.1186/s12859-017-1934-z).