

## Supporting Information

Fig. S1 A bar graph displaying the abundance of different morphologies synthesized with varying methane concentrations.

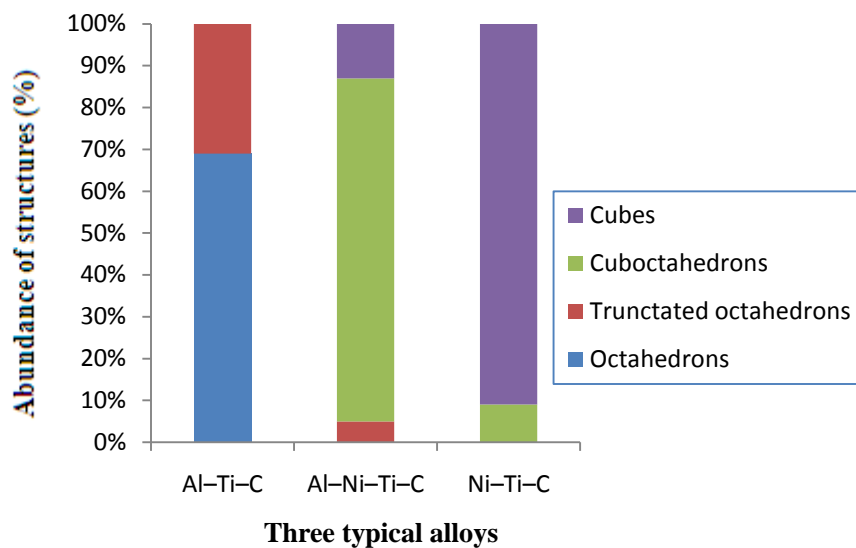


Fig. S2 Atom arrangement of {100}, {110} and {111} faces. (a–c) Side view of faces {100}, {110} and {111}; (d–f) Atomic arrangement along the <100>, <110> and <111> direction.

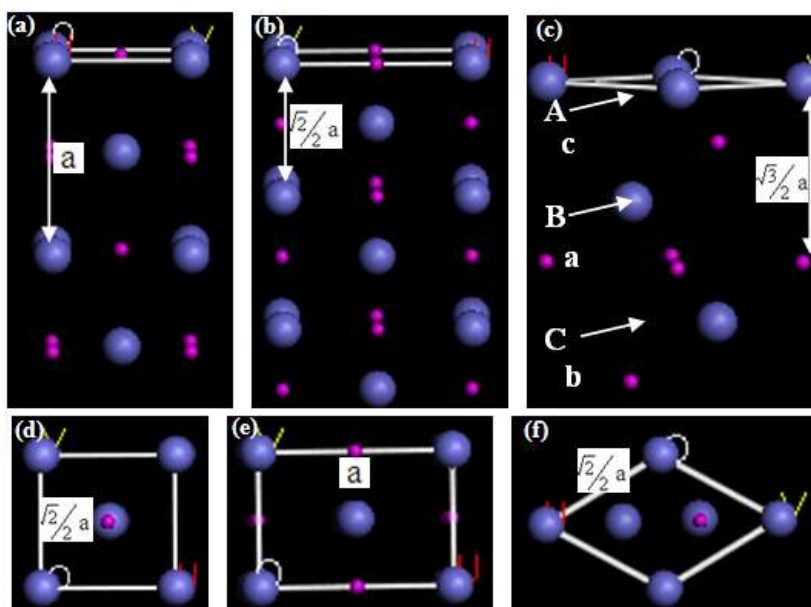


Fig. S3 Schematic showing the growth process of octahedral TiC.

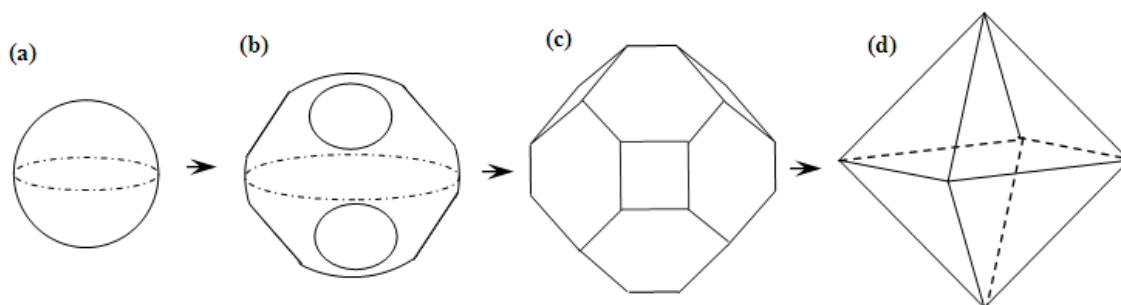


Fig. S4 Typical morphologies of TiC in Ni–Ti–C alloy: (a) Primary TiC cube; (b) Eutectic TiC dendrites.

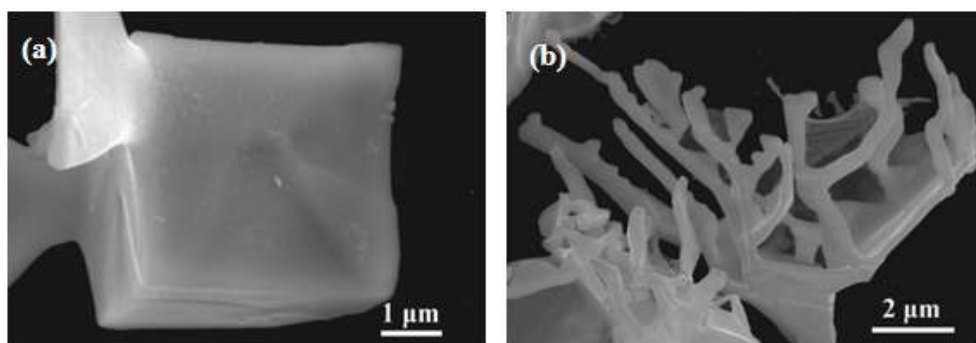


Fig. S5 (a, b, c) the XRD pattern and FESEM images of the extracted TiC in Al-Fe-Ti-C;  
(c, d) Crystal morphologies of TiC fabricated in Fe-Ti-C system.

