Supplementary Material

High temperature *in situ* SEM assessment followed by *ex situ* AFM and EBSD investigation of the nucleation and early growth stages of Fe/Al intermetallics

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This file includes supplementary Table S1 and Figs. S1 - S4.

Table S1: Chemical composition (wt. %) of DP600 and AA6061-T6 used in the experiment.

Alloying elements	Al	Fe	Mn	Si	Cr	Ni	C	Mg	Cu
DP600 steel	0.03	97.40	1.93	0.24	0.20	0.02	0.04		
AA6061 – T6	97.50	0.44	0.05	0.56	0.19			0.93	0.24

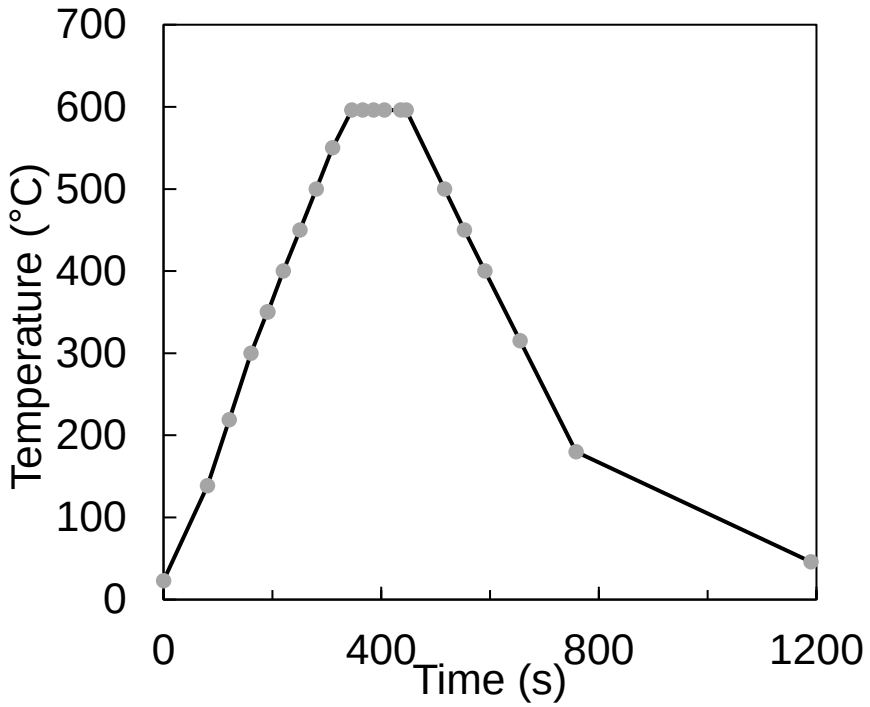

Fig. S1. Temperature evolution with the time measurement recorded during the *in situ* SEM experiment.

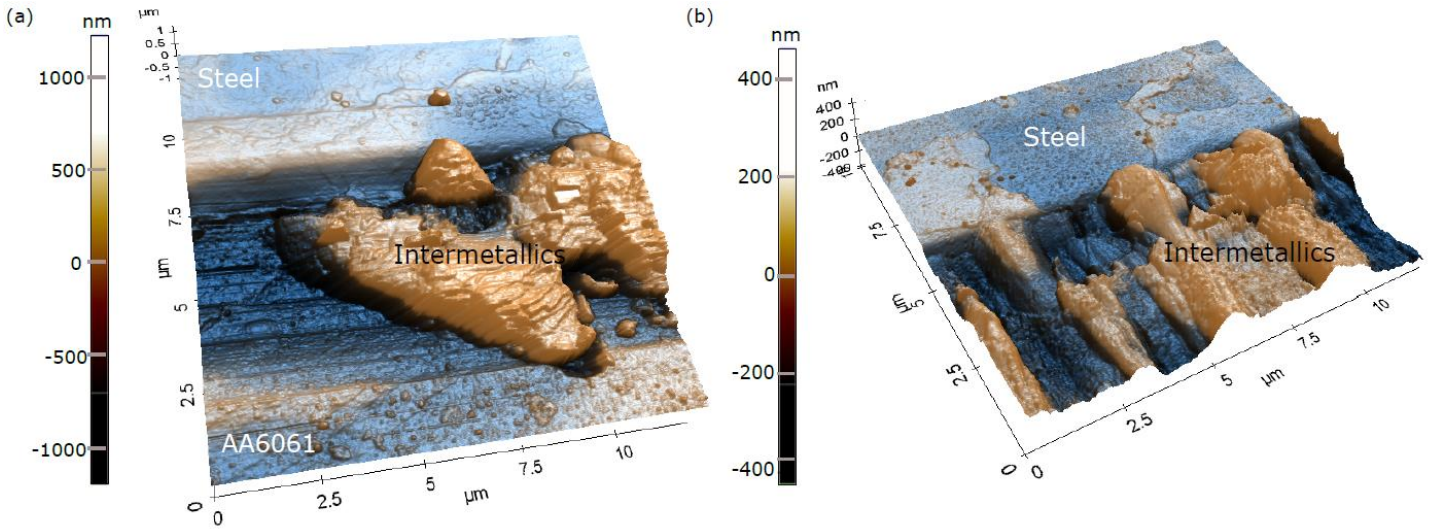

Fig. S2. 3D view of the AFM topography images showing the morphology of the IMs at the Al-Fe interface: (a) IM nucleation (at location A) and (b) further directional IM growth across the interface (at location B) [color legends indicate the Z-height].

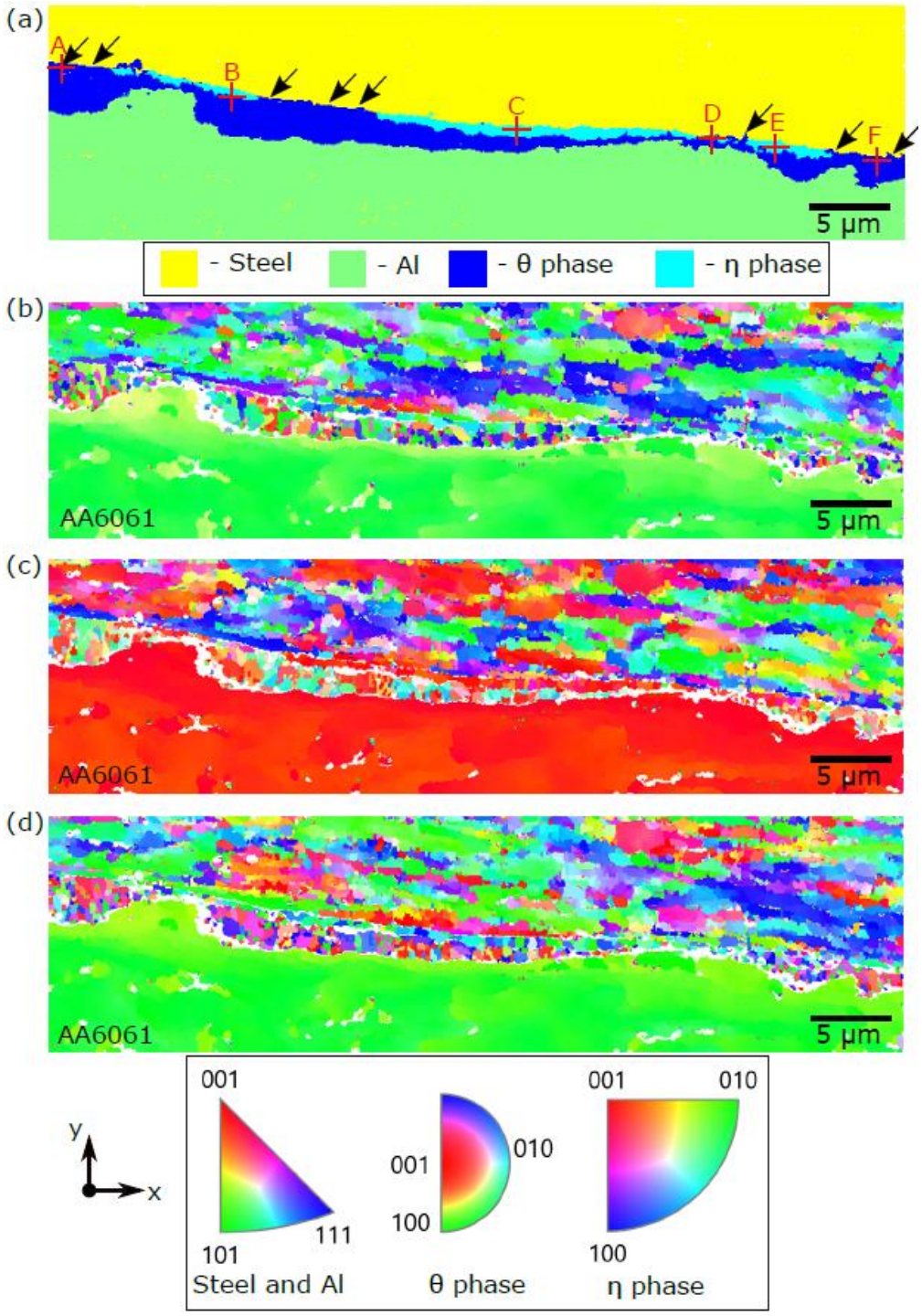

Fig. S3. EBSD results after *in situ* heat treatment corresponding to the area enclosed by the yellow rectangle in Fig. 2d. Due to the multi-material nature of the interface, the phase map of the nucleated IM phases (θ and η) AA6061 and bcc-Fe in (a) is again included in this supplementary figure to quickly identify the phases in the IPF maps given for (b) X direction, (c) Y direction and (d) Z direction.

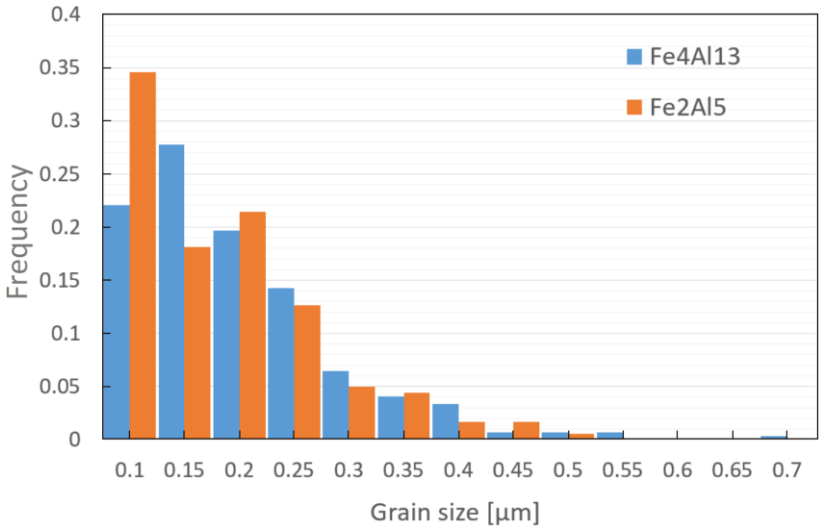

Fig. S4. Histograms of grain size distribution for both θ and η phases.