Supplementary material for: On the effect of boron treatment on Mn-containing aluminum alloys studied by Laser-Induced Breakdown Spectroscopy (LIBS).

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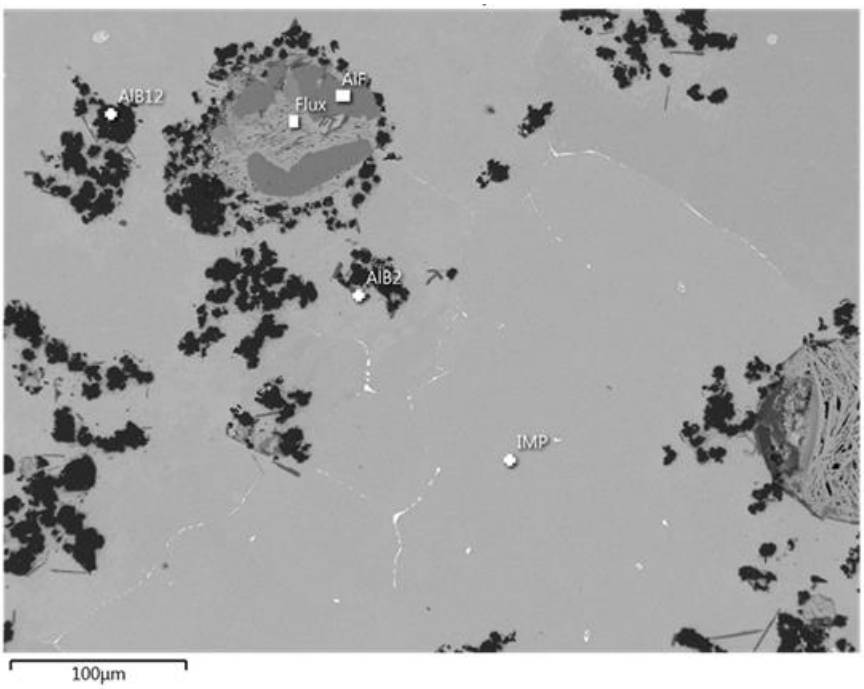
Metallographic analysis of Al-B master alloys

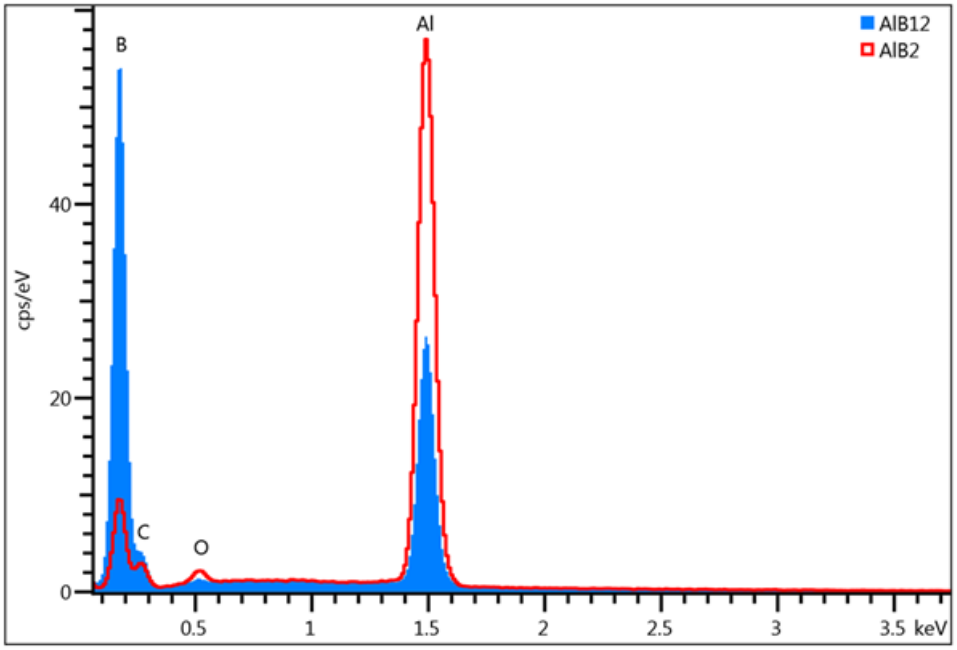
Two different Al-B master analysis were investigated: Al-5B and Al-8B (wt.%). From each master alloy, metallographic cross sections were made through 2 small samples from the master alloy waffles. The microstructure was documented using SEM/EDS. The image analysis took approximately 30 fields of view into account, representing approximately 3 mm^2 of each sample surface. Distinction of AlB_2 and AlB_{12} was based on grey level thresholding from composition contrast of backscattered electrons in the SEM. AlB_{12} shows up darker than the AlB_2 particles.

1. Al-8B (wt.%) master alloy

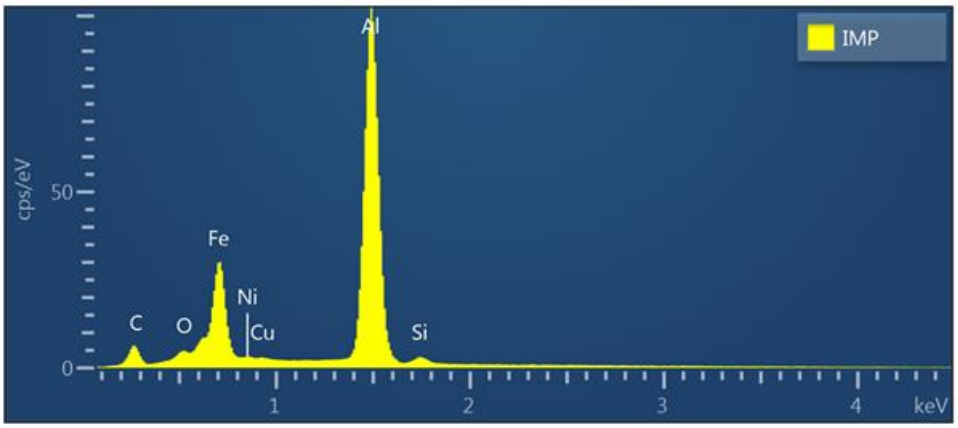


Supplementary Fig S-1: Al-8B (wt.%) SEM image analysed by EDS (White points with label indicate where EDS analysis was performed)

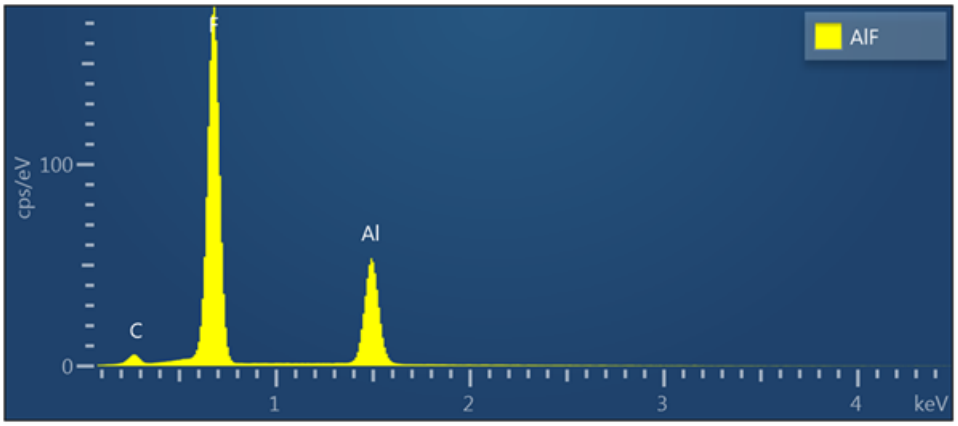
Supplementary Fig. S-1 displays a SEM image of Al-8B (wt.%) master alloy, which was dominated by big and dark particles which were identified as AlB_{12} by EDS analysis in Supplementary Fig. S-2. EDS analysis was performed in the SEM image displayed in Fig. S-1 on the white points present in the image. Supplementary Fig. S-2 shows the EDS spectra for AlB_{12} and AlB_2 points from Fig. S-1. For Al-8B (wt.%), AlB_{12} dominates the structure with only a few AlB_2 particles. Additionally, some (K, Al)-fluoride from the manufacturing process is present on the ingot as shown by the spectra in Supplementary Fig. S-4 and Fig. S-5. Finally, a Fe-rich intermetallic particle was identified in the spectra in Supplementary Fig. S-6



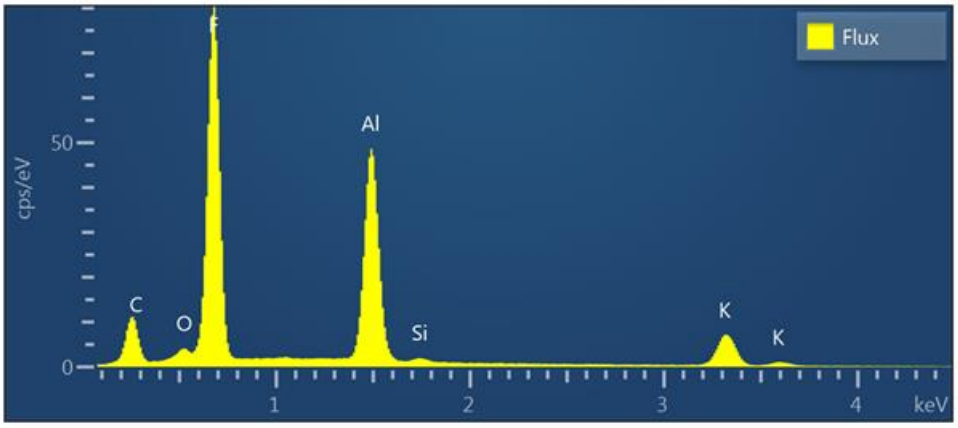
Supplementary Fig S-2: EDS spectra from AlB_{12} (blue) and AlB_2 (red) points from Fig S-3.



Supplementary Fig S-3: EDS spectrum from "IMP" point in Fig. S-3



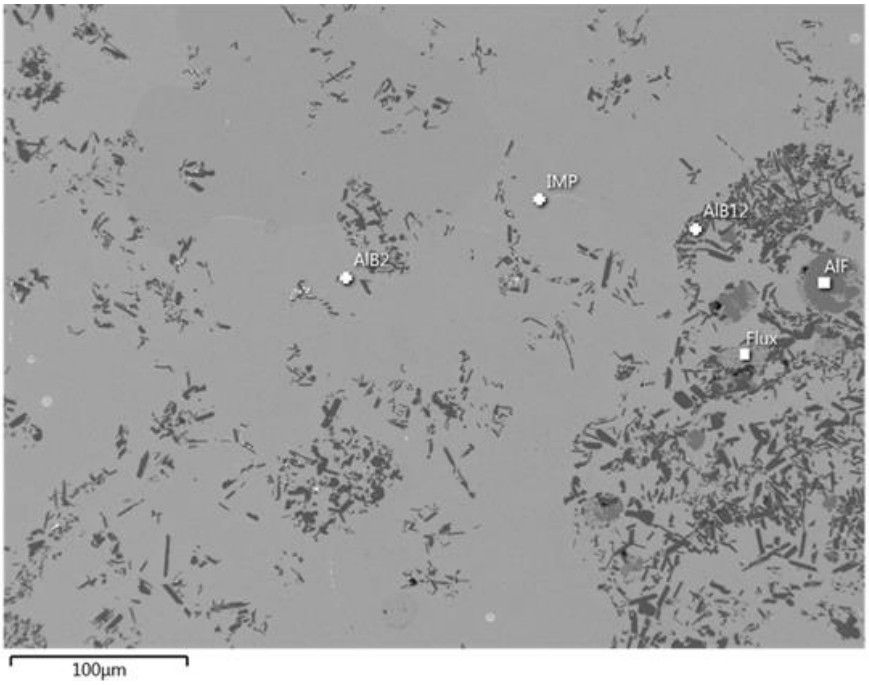
Supplementary Fig S-4: EDS spectrum from “AlF” point in Fig. S-3



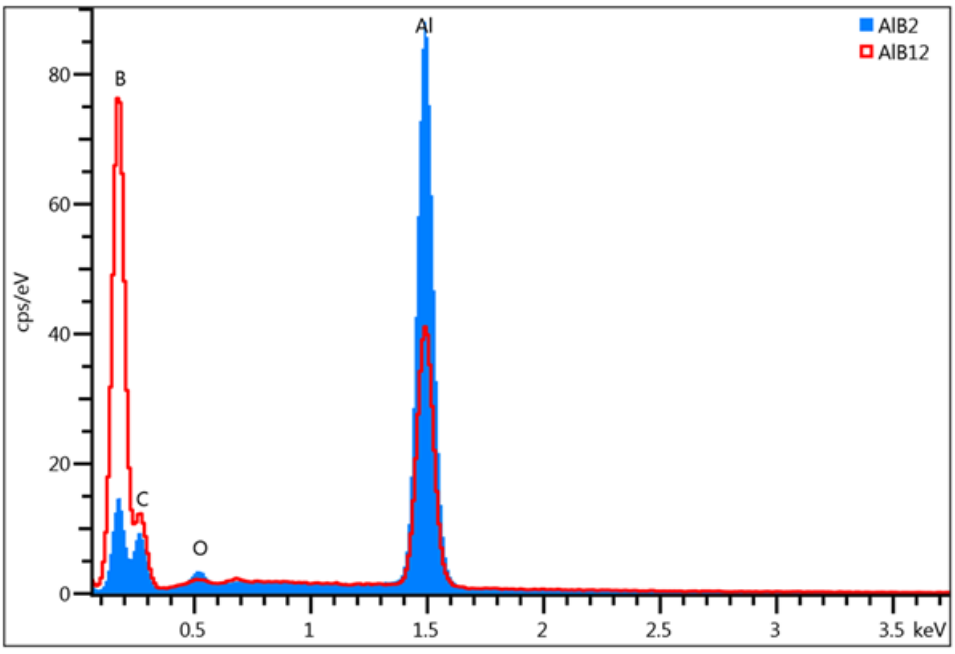
Supplementary Fig S-5: EDS spectrum from “Flux” point in Fig. S-3

2. Al-5B (wt.%) master alloy

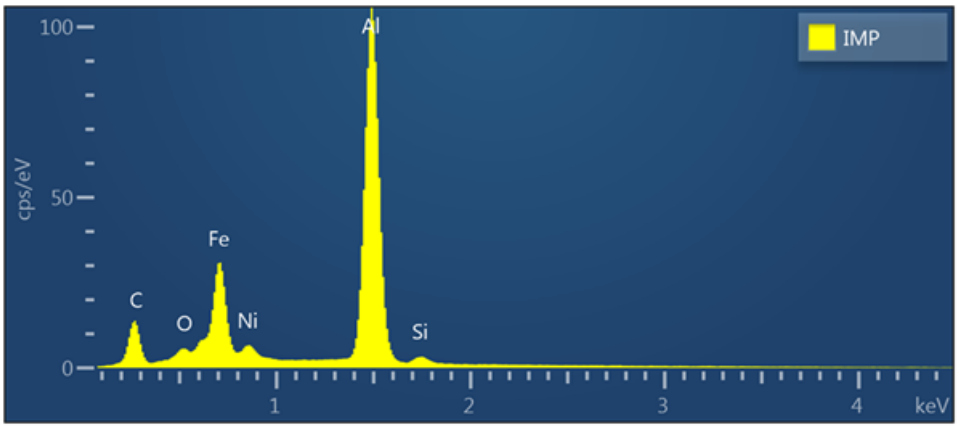
Supplementary Fig. S-6 displays a SEM image of Al-5B (wt.%), which is dominated by grey particles which have been identified as AlB_2 by EDS analysis in Supplementary Fig. S-7. EDS analysis was performed in the SEM image from Supplementary Fig. S-6 on the white points present in the image. Supplementary Fig. S-7 provides the EDS spectra for AlB_2 and AlB_{12}. For Al-5B (wt.%), AlB_2 dominates the structure. Additionally, and similarly to Al-8B (wt.%), some (K, Al)-fluoride from the manufacturing process was present on the ingot as shown by the spectra in Supplementary Fig. S-9 and Fig. S-10. Also, the EDS spectrum from a Fe-rich intermetallic particle is given at Supplementary Fig. S-8.



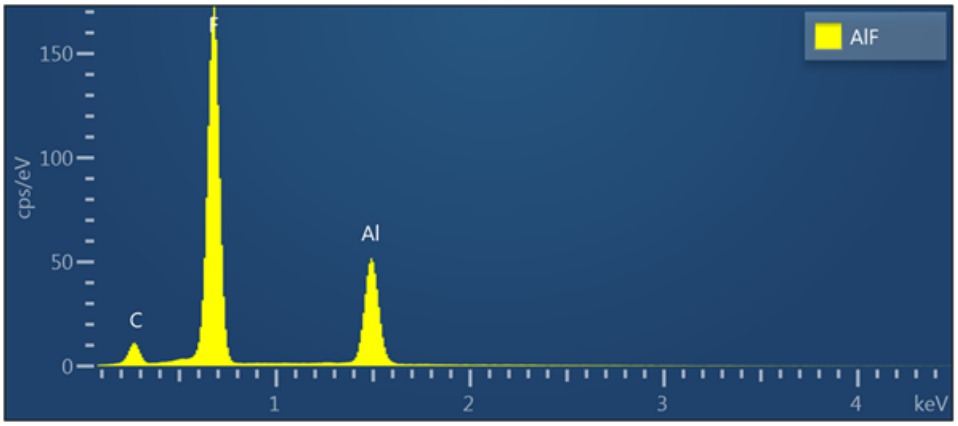
Supplementary Fig S-6: Al-5B (wt.%) SEM image analysed by EDS (White points with label indicate where EDS analysis was performed)



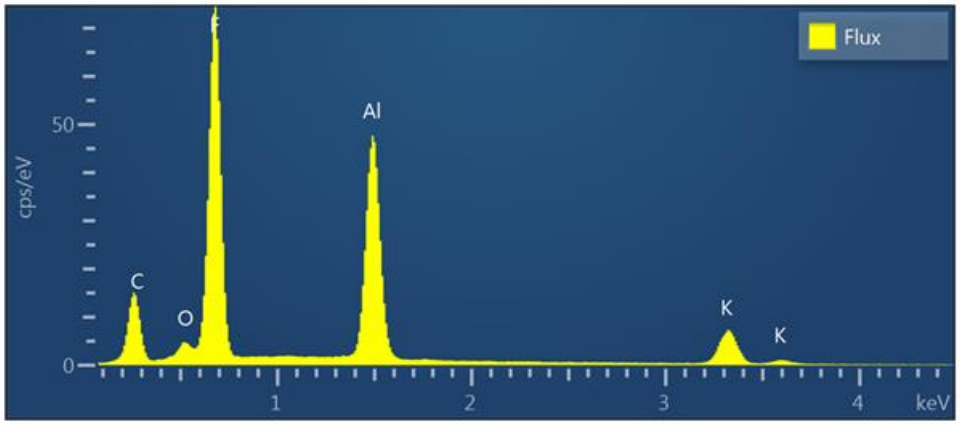
Supplementary Fig S-7: EDS spectra from AlB_{12} (red) and AlB_2 (blue) points from Fig S-7.



Supplementary Fig S-8: EDS spectrum from “IMP” point in Fig. S-7



Supplementary Fig S-9: EDS spectrum from “AlF” point in Fig. S-7



Supplementary Fig S-10: EDS spectrum from “Flux” point in Fig. S-7