# Recycled aluminium through innovative technology (REALITY)

K.W. Al-Helal, J.B. Patel and Z. Fan

The REALITY project works towards supporting vehicle manufacture in the UK industry and allows Jaguar Land Rover to demonstrate a competitive leadership in reducing $CO_2$ emissions at the source of manufacture.

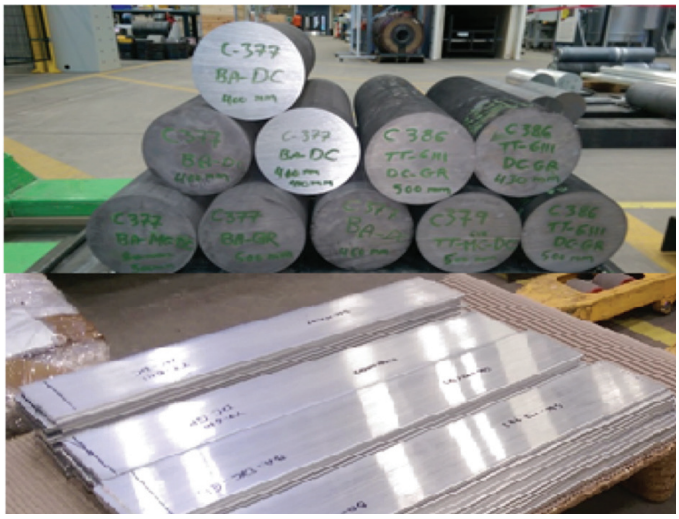


**FIGURE 1.** DC-GR and MC-DC billets with extrusioned flat bars of BA-6111 and TT-6111.

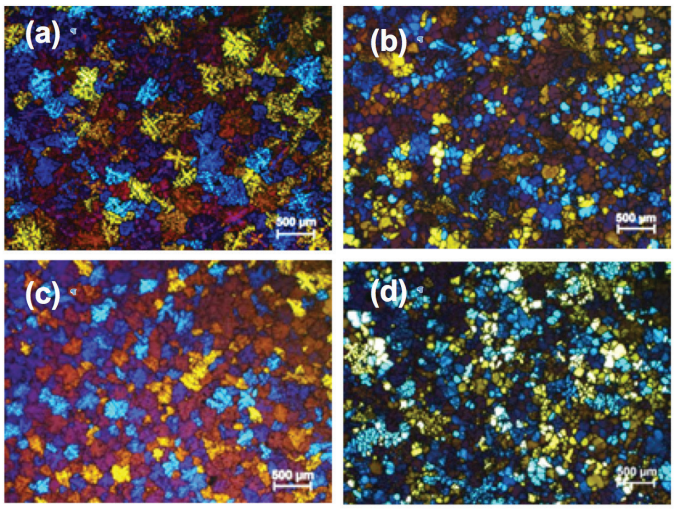


**FIGURE 2.** Optical micrographs; (a, c) DC-GR and (b, d) MC-DC of BA-6111 and TT-6111 alloys respectively.

Cost effective automated separation processes for shredded scrap will enable the closed-loop recycling of end-of-life vehicles back into high performance product forms for new vehicle body manufacture in the UK, providing significant $CO_2$ savings using less or no primary metal and generating major cost savings. REALITY is a 36 months project to enable the development and industrial deployment of sensor-based scrap sorting technologies to separate wrought and cast alloys, then to further separate wrought alloys into alloy types, which has never been achieved before. Full scale recycled scrap based sheet and castings will be produced and evaluated. The organisations involved in this project are: Jaguar Land Rover, Axion, Novelis, Norton Aluminium, Innoval Technologies, Brunel University London and the University of Warwick. The UK, the major exporter of more than 1 Mt of aluminium scrap from the EU each year, will be uniquely placed to use, rather than export this precious scrap, which is based on secondary aluminium alloy resource. The source materials are bottom ash 'BA', taint tabor 'TT' and end-of-life vehicle 'ELV' alloys.

The source of recycled aluminium is from Axion ELVs, which is obtained from Jaguar Land Rover ex-engineering and ex-crashed cars. These ELVs will be shredded and automatically sorted using state-of-the-art sensing and sorting technologies. BA is provided by Scanmetals UK Ltd and is the ash aggregate formed when waste is burned in an incinerator. Following combustion, a certain amount of metallic material is left within the ash, which can then be processed and recovered. At BCAST, 300 kg of BA was melted and cast into ingots to produce 180 kg with a AA6111 alloy composition.

BCAST's melt conditioning technology was tested using their scale up facilities, to identify if the technology is capable of tolerating the impurities in these sources, to then be used for either coil production or for the commercial scale shape casting by high pressure vacuum die-casting. Materials evaluation and characterisation will be carried out on both the resultant sheet and cast product forms.

Experiments were also conducted at the AMCC facilities for direct chill grain refined (DC-GR) and melt conditioned direct chill (MC-DC) billets, followed by extrusions into flat bar ~ 118 mm x 4.8 mm of BA-6111 and TT-6111 alloys, as shown in Figure 1. The optical micrographs show equiaxed refined grains with no casting defects for the MC-DC billets of BA and TT alloys, as shown in Figure 2. More work will be performed for MC-DC of the ELV alloy, conventional twin roll casting and melt conditioned twin roll casting of BA-6111 and TT-6111 alloys, with microstructure and tensile property evaluation to follow.