Abstract

Recycling must be one of the top social and economic priorities in Iraq; the aluminum can is the most valuable packaging material to recycle where anyone can be playing a part. In this thesis, recycling of aluminum cans in Iraq for private sector has been studied, the experimental results of recycling issues such as; characterization and properties of out-put samples taken from different location of private factories, effect of additives, degassing, and recycling type; conventional, and new approach pressing achieved with different size pieces were investigated in this thesis.

To prepare data-base of characterization of ingots produced in private sector factories, four samples have been taken from different region in Iraq;(Alkamaliya, Alamariya) in Baghdad, Al-Hilla and Alnajaf and compared with a reference one prepared in laboratory, from Aluminum beverage cans scrap of Baghdad wastes. Ingot casting is the process used for conventional recycling with degassing material to improve quality of ingot. The tests involve; chemical compositions (XRF), microstructure, X-ray diffraction (XRD), scan electrical microscope (SEM), and mechanical properties (hardness and tensile tests).

Adding degassing increases tensile strength and percentage elongation in comparing with that of the private sectors (without use degassing) by (10 %) than Alkamaliya and by (18 %) than Al-Hilla respectively, while hardness and modulus of elasticity for Alamariya and Al-Hilla are higher by (41 %) and (20 %) respectively than that from lab sample.

To estimate the real metal losses for all the melted scrap, the outputs of metal ingots were compared with scrap inputs, taking into account foreign material (paint, paper, plastic, lubricants etc). Also the slag has been XRD tested and the (Al, MgO, Al_2O_3, $MgAl_2O_4$) phases were found. Adding degassing can reduce dross by (15.2 %) and increase yield. It was

noticed the absence of magnesium element in chemical composition of aluminum recycled beverage cans during processing and also it has been seen that recycling aluminum cans with adding degassing is more yield than that without adding degassing.

To achieve better mechanical properties and strengthening Aluminum ingot, different amounts of (0.6, 1.2, 1.8 wt %) of Iron powder were added before pouring. Adding (1.2 %) Iron powder gets higher elongation by (57 %) than adding (0.6 %) Iron powder and higher modulus of elasticity by (38 %) than adding (1.8 %) Iron powder and higher tensile strength by (17%) than adding (0.6 %) Iron powder. While Vickers hardness was increased with adding Iron powder.

The recycled Aluminum cans by direct recycling (solid state) using hot compaction, almost has less formability when compared with that of conventional recycling using ingot casting so that it is preferred to be used as final product. Hardness of product decreases with increasing size of start can-pieces by direct recycling process. Recycled specimens by direct recycling exhibited almost more hardness when compared with conventional recycling using ingot casting. The size of can-pieces is an important factor for the control of the contamination level of oxides in solid-state recycling. It was found that the direct recycling (lab sample) with small size has higher hardness by (43.6 %) than conventional recycling lab sample and by (16.3 %) than (1.8 %) iron powder adding sample