

ALUMINUM MELT CLEANLINESS PERFORMANCE EVALUATION USING PoDFA (POROUS DISK FILTRATION APPARATUS) TECHNOLOGY

Carmen STANICĂ¹, Petru MOLDOVAN²

Prezența incluziunilor nemetalice solide în aliajele de aluminiu poate provoca scăderea valorilor proprietăților mecanice ale produselor turnate, creșterea porozității gazoase, o prelucrabilitate prin aşchiere slabă, micșorarea fluidității și o calitate slabă a suprafeței.

Technicile pentru determinarea incluziunilor pot fi: metalografie cantitativă, analize chimice, teste volumetrice, tehnici nedestructive și altele.

Scopul lucrării este studiul evaluării purității topiturilor din aliaje de aluminiu 5083 prin tehnica PoDFA.

Datele obținute prin analiză arată că probele din aliaj 5083 sunt pure. Conținutul de incluziuni este cuprins între 0.011 mm³/kg și 0.025 mm³/kg, principalele incluziuni fiind TiB₂, Al₄C₃, Al₂O₃, MgO, spinel și material refractar.

The presence of solid non-metallic inclusions in aluminum alloys can cause reduction in mechanical properties of castings, increased gas porosity, poor machinability, decrease in fluidity and poor surface quality.

Techniques for inclusions assessment can be: quantitative metallography, chemical analysis, volumetric tests, nondestructive techniques and so on.

The focus of this paper is to study the assessment of melt cleanliness in 5083 aluminum alloy using PoDFA technique.

Analysis data reflect the cleanliness of 5083 alloy actually sampled. The inclusions content was between 0.011 mm³/kg and 0.025 mm³/kg, the main inclusions being TiB₂, Al₄C₃, Al₂O₃, MgO, spinel and refractory material.

Keywords: aluminum, cleanliness, PoDFA, inclusions

1. Introduction

Aluminum alloys are characterized by their low specific weight, low melting point, negligible gas solubility with the exception of hydrogen, excellent castability, good machinability, and good corrosion resistance. Premium quality castings are an essential requisite for the critical structural components used in automotive and aeronautics. The production of such castings requires that inclusions and porosity be minimized (or even eliminated) to suppress their

¹ Ph.D. student, VDMETCO ALRO Slatina, Romania, e-mail: cstnic@vdmec.com

² Prof., Dept. of Engineering and Management for Elaboration of Metallic Materials, University POLITEHNICA of Bucharest, ROMANIA, e-mail: yahoo2002@yahoo.com

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Samuel Wagstaff



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Light Metals 2014 John Grandfield, 2016-12-23. The *Light Metals* symposia are a key part of the TMS Annual Meeting Exhibition, presenting the most recent developments, discoveries, and practices in primary aluminum science and technology. Publishing the proceedings from these important symposia, the *Light Metals* volume has become the definitive reference in the field of aluminum production and related light metal technologies. The 2014 collection includes papers from the following symposia: Alumina and Bauxite, Aluminum Alloys, Fabrication, Characterization and Applications, Aluminum Processing, Aluminum Reduction Technology, Cast Shop for Aluminum Production, Electrode Technology for Aluminum Production, Light metal Matrix Nano composites.

Light Metals 2022 Dmitry Eskin, 2022-02-05. The *Light Metals* symposia at the TMS Annual Meeting Exhibition present the most recent developments, discoveries, and practices in primary aluminum science and technology. The annual *Light Metals* volume has become the definitive reference in the field of aluminum production and related light metal technologies. The 2022 collection includes contributions from the following symposia: Alumina and Bauxite, Aluminum Alloys, Processing and Characterization, Aluminum Reduction Technology, Aluminum Reduction Technology Joint Session with REWAS, Decarbonizing the Metals Industry, Cast Shop Technology, Electrode Technology for Aluminum Production, Primary Aluminum Industry, Energy and Emission Reductions, An LMD Symposium in Honor of Halvor Kvande, Recycling and Sustainability in Cast Shop Technology, Joint Session with REWAS 2022.

Light Metals 2013 Barry Sadler, 2017-08-18. **Light Metals 2012** Carlos E. Suarez, 2012-05-11. An update of the definitive annual reference source in the field of aluminum production and related light metals technologies, a great mix of materials science and practical applied technology surrounding aluminum, bauxite, aluminum reduction, rolling, casting, and production.

Light Metals 2025 Les Edwards, 2025-03-02. The *Light Metals* symposia at the TMS Annual Meeting Exhibition present the most recent developments, discoveries, and practices in primary aluminum science and technology. The annual *Light Metals* volume has become the definitive reference in the field of aluminum production and related light metal technologies. The 2025 collection includes contributions from the following symposia: Alumina, Bauxite, Aluminum Alloys, Development and Manufacturing, Aluminum Reduction Technology, Decarbonization and Sustainability in Aluminum, Primary Processing, Joint

Session of Aluminum Reduction Electrode Technology and REWAS 2025 Electrode Technology for Aluminum Production Melt Processing Casting and Recycling Recycling and Sustainability in Cast Shop Technology Joint Session with REWAS 2025 Scandium Extraction and Use in Aluminum Alloys *Transactions*, 1991 *Sensors, Sampling, and Simulation for Process Control* Brian G. Thomas, Yurko, Lifeng Zhang, 2011-04-12 This symposium aims to explore the current state of the art in control of industrial processes in the field of extraction and processing of metals and materials New sensor technologies more advanced real time models and faster computers are enabling better control systems for these processes Specific topics include but are not limited to 1 novel sensors for hostile environment materials processes such as online inclusion detection temperature and velocity in molten materials surface condition of hot moving products etc 2 innovative online sampling and analysis techniques 3 models for real time process control and quality monitoring systems 4 process automation scheduling and plant wide logistics optimization 5 control of composition temperature microstructure and morphology in sintering smelting refining solidification reheating deformation and transport of ores slags mattes metals materials and aqueous solutions 6 prediction monitoring control and optimization of process parameters in these systems 7 control in manufacturing processes including casting annealing forging rolling extrusion powder metallurgy electronic materials welding etc 8 control of impurities and environmentally undesirable components in product and waste streams **Light Metals 2016** Edward Williams, 2016-12-20 The Light Metals symposia are a key part of the TMS Annual Meeting Exhibition presenting the most recent developments discoveries and practices in primary aluminum science and technology Publishing the proceedings from these important symposia the Light Metals volume has become the definitive reference in the field of aluminum production and related light metal technologies The 2016 collection includes papers from the following symposia 1 Alumina and Bauxite 2 Aluminum Alloys Processing and Characterization 3 Aluminum Reduction Technology 4 Cast Shop Technology 5 Electrode Technology 6 Strip Casting *3rd International Conference on Molten Aluminum Processing*, 1992 **The Encyclopedia of Advanced Materials** David Bloor, 1994 *Aluminum Now*, 2003 Light Metals 2023 Stephan Broek, 2023-07-20 The Light Metals symposia at the TMS Annual Meeting Exhibition present the most recent developments discoveries and practices in primary aluminum science and technology The annual Light Metals volume has become the definitive reference in the field of aluminum production and related light metal technologies The 2023 collection includes contributions from the following symposia 60 Years of Taking Aluminum Smelting Research and Development from New Zealand to the World An LMD Symposium in Honor of Barry J Welch Alumina Bauxite Aluminium Industry Emissions Measurement Reporting Reduction Aluminium Waste Management Utilisation Aluminum Alloys Characterization and Processing Aluminum Reduction Technology Cast Shop Technology Electrode Technology for Aluminum Production Scandium Extraction and Use in Aluminum Alloys **Aluminium**, 2004 *Light Metals* 1997 Christian Bickert, R. I. L. Guthrie, Canadian Institute of Mining, Metallurgy and Petroleum, 1997 Foundry Processes Seymour Katz, Craig F. Landefeld, 1988-06 For a number of years it

has been a General Motors Research Laboratories custom to hold a symposium on a subject which is new and emerging and to invite the best people in the world in that subject to come together to talk to each other Initially I had some difficulty in regarding foundry processes as a new and emerging subject Copper alloys have been in foundry practice for about six thousand years Foundrymen working with those alloys have been recognized as such for nearly all that time Iron has a much shorter history probably only three or four thousand years So what s new What is new is that a subject which has always been so complex and so difficult that it could only be a craft skill with bits and pieces of knowledge and bits and pieces of insight has begun to yield to new abilities to solve very complex problems We do this now because we can handle great amounts of data by computational means using new and more complicated theoretical treatments than we could deal with before In fact we have a new technology with which we can attack these terribly difficult problems Thus foundry processing is becoming a new subject because new things can be done with it

Encyclopedia of Aluminum and Its Alloys, Two-Volume Set (Print) George E. Totten, Murat Tiryakioglu, Olaf Kessler, 2018-12-07 This encyclopedia written by authoritative experts under the guidance of an international panel of key researchers from academia national laboratories and industry is a comprehensive reference covering all major aspects of metallurgical science and engineering of aluminum and its alloys Topics covered include extractive metallurgy powder metallurgy including processing physical metallurgy production engineering corrosion engineering thermal processing processes such as metalworking and welding heat treatment rolling casting hot and cold forming surface engineering and structure such as crystallography and metallography

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