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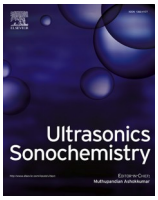
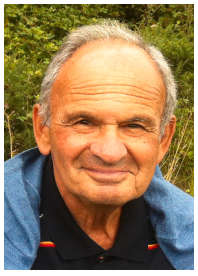


Editorial

For Georgy I. Eskin – On the occasion of his 90th birthday

The editors of Ultrasonics Sonochemistry are pleased to endorse the note below from Prof. Dmitry Eskin on the occasion of Prof. Georgy I. Eskin' 90th birthday. Prof. Georgy Eskin has contributed to the advancement of knowledge in ultrasonics and sonochemistry through his pioneering work on applications of ultrasonic cavitation to degassing, filtration, structure refinement and making advanced alloys.

Editors, Ultrasonics Sonochemistry



Georgy I. Eskin was born in Moscow in 1933 to a family of prominent biologists. His father was a professor at the Moscow State University and later at the Institute of Endocrinology, with prominent contributions to genetical endocrinology. His mother was an ichthyologist. However, and on advice of his uncle who was working in aviation industry and led an engineering publishing house, he chose to follow a career in engineering and graduated *cum laude* from the Bauman Moscow State Technical University in 1956 as an engineer in metals science. He became interested in research from his undergraduate years and was drawn to the application of high-frequency vibrations to materials processing. His graduation thesis was on the acceleration of heat treatment of Al alloys through ultrasound-aided diffusion and precipitation. After graduation he joined a metallurgical plant 'Nauka' as a research engineer and later a head of laboratory. This plant developed and supplied parts for the newly established aerospace industry. One of the challenges was to produce thin-walled investment castings from high-quality aluminium melt. This led to the pioneering technologies and industrial applications of ultrasonic melt degassing and ultrasound-aided investment casting developed by G. Eskin. Some current researchers like to say that the ultrasonic melt processing never went outside the small-scale lab experiments. They need to look for examples of industrial application by Georgy Eskin that are going back to the 1960s and are well documented.

Throughout his scientific and research carrier Georgy successfully combined fundamental scientific studies with technological development and industrial-scale applications. While still working in industry, he defended a PhD thesis on ultrasonic melt processing (1962) and wrote a number of significant papers and books in Russian, including "*Ultrasound in Metallurgy*'' (1961), "*Ultrasonic Treatment of Molten Aluminium*'' (1965) and "*Investment Casting of Aviation Parts from Aluminium Alloys*'' (1967). In 1967 he was invited to join the All-Union Institute of Light Alloys (VILS) where he worked until 2012 as a Senior and then Principal Scientist, leading the research group on ultrasonic melt processing. Throughout these 45 years he made breakthrough technological advances in ultrasonic melt processing, with applications to the direct-chill (DC) casting of Al and Mg alloys, melt purification and cleaning, rapid solidification, manufacturing composite materials and semi-solid feedstock. The main focus was on the production of high-quality billets and ingots from commercial aluminium and magnesium alloys. As a result, the large-scale ultrasonic melt treatment equipment and technologies were developed for filtration, degassing (UZFIRALS process patented in most of industrial countries) and grain refinement upon DC casting. The important contribution was in the research and selection of proper materials (i.e. Nb-based alloys) for sonotrodes enabling their stability in the aluminium melt. Unfortunately, many current researchers ignore these basic principles and use materials (e.g. Ti or Fe-based) that are absolutely not fit for the ultrasonic melt processing of aluminium alloys, leading to erroneous results and interpretation.

The new ultrasonic technology developed by Georgy Eskin in the 1970–1980s allowed the production of unique large billets from high-strength aluminium alloys with nondendritic structure and improved properties. These advances would not be possible without through fundamental research where Georgy Eskin made major contributions to the understanding of the fundamental mechanisms of cavitation-aided melt processing. In addition to discovering the leading role of cavitation in filtration and degassing, he suggested an original theory of heterogeneous nucleation of primary phases on the nonmetallic substrates activated by ultrasonic cavitation. This process can ultimately lead to the formation of nondendritic grain structure with the nondendritic grain size depending solely on the cooling rate. He summarised his research and development work in the Second Edition of the monograph "*Ultrasonic Treatment of Molten Aluminium*" published in 1988 in the USSR. He was awarded a Dr. Sci. degree in 1982 for the development of a new scientific direction of ultrasonic melt processing. Later, in 1990, he became a full Professor in Moscow Institute of Steel and Alloys and in the same year became a co-founder and also a full member of the Russian Academy of Natural Sciences. Prof. Georgy Eskin did a lot for popularization of ultrasonic processing through his lectures and publications such as "*Ultrasound Advanced into Metallurgy*" (1970, Second Edn. 1975). His fundamental and applied research is summarized in more than 400 scientific papers, more than 100 patents, and 10 monographs, reference books and textbooks.

Up until the late 1980s, Georgy Eskin was not allowed to travel abroad and his work was not widely known outside the USSR, except for

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the patents that were issued in many countries. Since 1990s he attended major international conferences, in many cases as an invited or keynote speaker. He prominently contributed to the Meetings of European Society or Sonochemistry, International Conferences on Aluminium Alloys and International Conferences on Semi-Solid Processing. He also started to work with Western companies such as Alcan, Alcoa, Hydro Aluminium, Alusuisse, Pechiney, Wagstaff and Hoogovens. This led to a lot of industrial interest and pilot-scale trials in application of ultrasonic processing to aluminium casting.

He also started to publish his research in English and, therefore, the advances in ultrasonic melt treatment became accessible by the wider community. His papers in *Ultrasonics Sonochemistry* were published in 1994, 1995, 2001 and 2003 covering the main fundamental mechanisms of degassing, filtration, grain refinement, manufacture of composite materials as well as their industrial applications. These papers received well over 100 citations each with the paper on the broad prospects of commercial applications of ultrasonic melt treatment (2001) having over 400 citations. In 1994 he wrote a chapter entitled "*Degassing, filtration and grain refinement processes of light alloys in an acoustic cavitation field*'' to Volume 4 of a series of books "Advances in Sonochemistry" (Elsevier, 1994). His lifetime work was summarized in a major text book "*Ultrasonic Treatment of Light Alloys Melts*'' (Gordon and Breach, 1998; Second Edition, CRC Press, 2015). This book has almost 1000 citations so far.

The research and major contributions of Prof. Georgy Eskin to the science and technology of ultrasonic melt processing of metallic materials are well recognized by the research community and inspired generations of scientists and engineers across the world to do more in discovering the fundamental mechanisms and searching for new applications of ultrasonic processing.

Although officially having retired at the age of 80, Prof Georgy Eskin is still very much in tune with the modern developments. Let us wish him good health and happiness with many more years to come.

Dmitry Eskin