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# PROFESSOR QING-PING KONG: ZENER MEDALIST

The following is the text of an oral presentation delivered at the Zener Medal Award ceremony in Hefei on 23 September 2015.

*Keywords*: internal friction, mechanical spectroscopy, grain boundary, the Zener Price

Awarding the Zener Medal is always a memorable event for the whole internal friction and mechanical spectroscopy community. By conferring the Medal upon Prof. Kong, our community is acknowledging his outstanding and brilliant achievements in the world of science. The Zener Medal is undoubtedly the highest reward and tribute due to be paid to Prof. Kong for his long-term research efforts. We also wish to acknowledge his rigor and perseverance in his research work.

Professor Qing-Ping Kong

Professor Q.P. Kong is Research Professor at the Institute of Solid State Physics, Chinese Academy of Sciences, Hefei, China. In the past six decades, he has continuously worked in the field of internal friction and related areas, and provided a number of valuable contributions on grain boundary internal friction phenomena and creep behavior of nanocrystalline materials.

Looking back at the interpretation of grain boundary relaxation phenomena, there are a few reflections that I would like to share with you. The first of them is about the relation between theory and experiment: the experimental result might negate the theory; the theory, on the other hand, stimulates experiments. The interpretation of the grain boundary internal friction peak has been a tedious chore for decades. A great deal of complex experimental results were waiting for a self-consistent interpretation. The grain boundary peak changed from a paradigm to merely a result of particular coupled interactions. Another remark is that samples must be carefully designed to test various theoretical models and hypotheses. This approach was used by Prof. Kong in his systematic research on internal friction in bicrystals with different misorientations.

I remember my talk at the First International School on Mechanical Spectroscopy (Mechanical Spectroscopy MS-1, September 8-18, 1991, Kraków, Poland) and discussion with Dr. K.L. Ngai and Dr. J. Woirgard. I was invited to give lectures on the Introduction to Mechanical Spectroscopy (L.B. Magalas) and Application of the Coupling Model to some Problems in Mechanical Spectroscopy in Metals (K.L. Ngai, L.B. Magalas). We prepared a manuscript on cooperative relaxations in correlated many-body systems, which included a tentative interpretation of the grain-boundary peak in metals and alloys in terms of the coupling model. Later, K.L. Ngai decided to delete this chapter since at that time, a critical experimental result to support the coupling model in the context of the grain boundary peak was not available yet. No revolution was anticipated in our understanding of the grain boundary relaxation. The idea of using the coupling model emerged again much later, after the splendid experimental work that was completed by Prof. Kong. With his coworkers, he has systematically studied internal friction in bicrystals with different misorientations. They discovered that the relaxation parameters in different types of grain boundaries vary depending on distinct microstructures. In addition to providing convincing evidence for the origin of grain boundary internal friction, they also revealed the coupling and compensation effect involved and explained a number of ambiguous phenomena taking place in grain boundary internal friction in polycrystals. These results constitute an important advancement in the field of the grain boundary internal friction.

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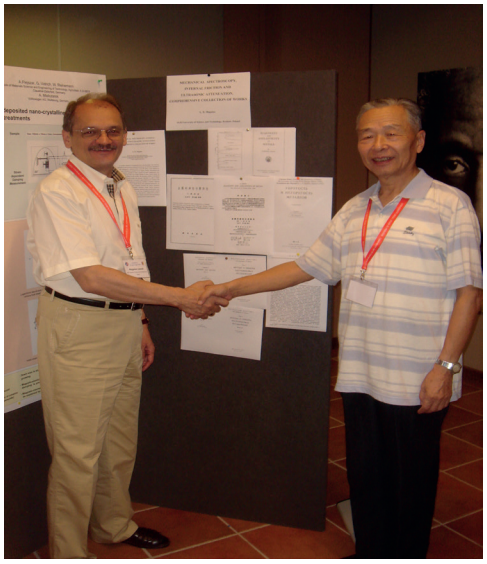
The analysis and application of cooperative relaxations in correlated many body systems requires a solid background in theoretical models of internal friction and a deep understanding of the spectroscopic approach to dissipation of mechanical energy in solids, that is, the fundamentals of mechanical spectroscopy. Based on it, many of us contributed to build up the field of complex cooperative relaxations, starting from the theoretical description of this model in polymers, amorphous materials and, two decades later, in metals and alloys. This opens an exciting area of new relaxation phenomena and their possible applications. Nowadays, the coupling model has spread to polymer science, to noncrystalline and crystalline materials, to dielectric, electric and mechanical relaxations.

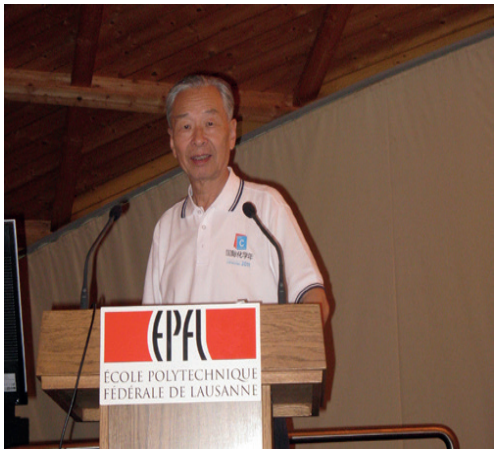
It was my great pleasure to hold discussions with prof. Q.P. Kong during the ICIFMS-15 Conference in Perugia, Italy. In the paper entitled 'Mechanical spectroscopy, internal friction and ultrasonic attenuation: Collection of works' (Materials Science and Engineering A 521-522 (2009) 405-415) the list of the most important books in internal friction and mechanical spectroscopy starts from the classic book of P. Debye, Polar Molecules, The Chemical Catalog Company, Inc. (1929) and the classic book of C. Zener, Elasticity and Anelasticity of Metals, The University of Chicago Press, Chicago, Illinois (1948). The classic book of Clarence Melvin Zener was translated into Russian (1954), French (1955), and Chinese (1965). Thus it is not surprising that the Chinese edition was translated by Prof. Q. P. Kong and his coworker Dr. B. L. Zhou.

I am very proud and thankful to the Chinese Academy of Sciences for the privilege in this moment to express to Prof. Kong our admiration and our deepest thanks for his achievements in materials science. To conclude my talk, I would like to thank Prof. Kong for this groundbreaking description of the relaxation phenomena caused by dissipation of mechanical energy at grain boundaries. For many of us gathered here today, it was the beginning of a great scientific adventure called relaxations in complex cooperative systems discovered in metals and crystalline solids.

Professor Ting-Sui Kê (Ge, Tingsui) received the Zener Medal in 1989. Professor Qing-Ping Kong has been a member of Professor T.S. Kê group since 1950s to study internal friction and mechanical properties of solids in China. Throughout his academic and research life, Prof. Kong has been a recipient of numerous honor and distinctions from the scientific community of China. In recognition of Prof. Kong's achievements, we are honoured to award him the Zener Medal.



Q.P. Kong and L.B. Magalas at the Fifteenth International Conference on Internal Friction and Mechanical Spectroscopy ICIFMS-15, Perugia, Italy, 2008




Q.P. Kong at the Sixteenth International Conference on Internal Friction and Mechanical Spectroscopy ICIFMS-16, Laussane, Switzerland, 2011


The Zener Medal awarded to Professor Qing-Ping Kong

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