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FOREWORD

An Introduction to Professor Shuichi Miyazaki

Professor Shuichi Miyazaki has made significant and milestone contributions to the knowledge and technology of shape memory alloys through his pioneering work in the past four decades. Professor Miyazaki obtained his Ph.D. degree in Materials Science and Engineering from Osaka University in 1979. He then joined University of Tsukuba as an Assistant Professor, and was promoted to Associate Professor in 1990, Full Professor in 1998, and Specially Appointed Professor in 2015, a post he still holds today. In his career, he has also received many visiting fellowships in other countries, such as Visiting Scientist at the University of Illinois and Gledden Visiting Senior Fellow at the University of Western Australia in the 1980s; Honorary Fellow at the University of Minnesota, Visiting Professor at the University of Franche-Comte, and Mosey Visiting Senior Fellow at the University of Western Australia in the 1990s; and a World Class University Professor at Gyeongsang National University, Visiting Professor at King Abdulaziz University, and Visiting Professor at Ecole Nationale Supérieure de Chimie de Paris in more recent times.

His work in the field of shape memory alloys spans across both fundamental science and applied technology. The major milestones of his work include:

1. Early development of the understanding of NiTi,
2. Thin film shape memory alloys,
3. Ni-free Ti-based shape memory alloys, and
4. High temperature shape memory alloys.

His early work in the 1980s on crystallographic mechanisms of martensite and the R-phase variant deformation using NiTi single crystals, such as the self-accommodation structures of martensite and R-phase transformations, the orientation dependence of deformation, and the effect of texture on mechanical behavior, laid the foundation for theoretical understanding of NiTi. His study on thermo-mechanical treatment and fatigue of NiTi paved the way for the development of the many practical applications and industrial production of NiTi alloys because it increased our ability to engineer and control the properties of these products.

In the 1990s he devoted much of his effort to developing NiTi-based ternary and quaternary alloys and pioneering shape memory thin films. The sputter-deposited thin films revealed the shape memory effect and superelasticity comparable to bulk NiTi alloys and achieved high actuation frequency of 100 Hz. This has greatly expanded the horizon of shape memory alloy application into the advanced technology of MEMS.

In the 2000s, in response to the demand for medical applications of shape memory alloys, he led the research and development of Ni-free β Ti-based shape memory alloys. He has developed a great many Ti-based alloys, including binary, ternary, quaternary, and more alloys, followed by the establishment of the basics of the deformation and transformation behavior of Ti-based alloys. He has also clarified the mechanisms of unusual phenomena, such as Invar effect, non-linear large elastic deformation, and heating-induced martensitic transformation in Ti-based alloys considering the unique effect of oxygen atoms. Another topical area in which Professor Miyazaki has made significant contribution is high temperature shape memory alloys, such as NiTi-based quaternary alloys, which demonstrated functional stability at high temperatures, and TiTa-based ternary alloys, which exhibited excellent deformability and promise for practical application in high temperature environment.

Professor Miyazaki has co-edited and co-authored seven books, including *Shape Memory Alloys*, published by Springer Verlag in 1996, *Shape Memory Alloys for Biomedical Applications*, published by Woodhead Publishing in 2009, *Thin Film Shape Memory Alloys*, published by Cambridge University Press in 2009, and *Shape Memory and Superelastic Alloys*, published by Woodhead Publishing in 2011. He has co-authored 26 book chapters and co-edited 12 special issues in international journals. His research has been published in more than 300 research papers in scholarly journals and in 78 review papers in materials science and engineering.

Professor Miyazaki has been the recipient of many national and international awards, including the Yamazaki-Teiichi Prize from the Foundation for Promotion of Material Science and Technology in 2002, the Minister Award from the Japan Ministry of Education, Culture, Sports, Science, and Technology in 2004, the Thomson Reuters' ISI Highly Cited Researcher in Materials Science Field in 2004, the First Place Prize in Class 5 at the International Metallographic Contest from the International Metallographic Society/ASM International in 2006, the Gold Medal Award from the Japan Institute of Metals in 2014, the Tsukuba Prize from The Science and Technology Promotion Foundation of Ibaraki in 2014, and the Honda Memorial Prize from the Honda Memorial Foundation in 2015.

Professor Miyazaki has also played important roles in the scientific and professional communities to promote research and technology. These include serving as President of the Japan Institute of Metals, a Cooperation Member of the Science Council of Japan, a member of International Advisory Committee of the International Conference on Martensitic Transformations, a Board Member of the International Organization of Shape Memory and Superelastic Technologies in ASM International, and a Board Member of the Honda Memorial Foundation, to name a few.