

Preface to the second edition

It is always a matter of praise when a publisher asks for a novel edition of a previous work that, surprisingly and pleasantly, encountered the favor of the public. This request is also a signal that the original book and the implemented architecture have met the public's needs. Of course, the fascinating field of the still-mysterious world of shape memory alloys (SMAs) may have exerted a significant role in the success achieved.

The original work was structured to touch on the main aspects of the realization of SMA-based systems. Fabrication, material modeling, device development, and practical implementations were all aspects that were treated, enriched with a bibliography that would have enabled the interested reader to deepen any selected subject.

With such a solid background, it might have been a mistake not to try to expand and complete the former edition. Indeed, many aspects should have been considered in the second edition to give an even more complete vision of the actual and potential impact of SMA for industry. Interaction with the authors of the first edition allowed us to identify additional items that would immediately have been worth including in a new edition. For the sake of truth, Elsevier and many anonymous commenters provided formidable support to make it better by transmitting their valuable and appreciated opinion.

The preliminary introductory section was then expanded with chapters devoted to the latest attainments and applicable regulations for the use and implementation of SMAs. The part dedicated to material behavior was enlarged to include a chapter concerning fatigue issues, and the one addressing modeling considers some innovative approaches. In the same way, the actuators section has been augmented with a work dedicated to unconventional actuators. However, the application segment has deserved the most significant expansion. It has been articulated into four parts dedicated to aerospace, biomedical, civil, and other industrial uses, and further organized into different chapters concerning selected topics.

The final result is impressive. The new edition of the book now contains eight sections and 25 chapters, almost doubling the previous one. The number of involved authors who have graciously made their expertise available has grown to 54. Most come from academia (33), with significant contributions given by research centers, small and medium enterprises, and industries (21). They represent 23 Italian and international institutions (including Brazil, South Africa, Switzerland, and the United States) and provide an exhaustive overview of the current SMA scenario as perceived by the worldwide scientific and technological community. The editorial team has been enlarged from the former section editors to manage the expected large amount of data and information

exchange properly. They have enthusiastically agreed to spend time on completing the envisaged opus.

That has been a necessary, but not a sufficient step. The final product was finally achieved because all of the editors, section editors, and participants have behaved like a trained team. They have worked synchronously for the common objective, continuously supported by the publisher's personnel, who have followed the historical evolution of this adventure since the very first moment. Here, we acknowledge the efforts of Gabriela Capille, Christina Gifford, Joseph Poulouse, Narmatha Mohan, and all others working on this project within Elsevier.

After more than 50 years since the discovery of their properties, many potentialities of SMAs remain a black box. After the first trials and preliminary static implementations, many devices have been introduced in different fields of engineering, often at the edge of knowledge. Current systems refer only partially to the most acknowledged characteristic of SMAs, the shape memory. Many others instead rely on their superelastic, damping, or high-strain characteristics, for instance. It seems that it finally invaded the market to a significant extent only after the technical community started appreciating the material as a whole.

In aerospace, SMA elements were thought to extrapolate their shape characteristics to wing sections. Today, more realistically, they are mostly used as inner actuators, suitably designed to generate outline variations. In the biomedical field, adaptive stents and filters are evidence of the shape memory potentialities. In the large and mass-market scenario, their constant stress peculiarity has provided dentistry with a new, impressive tool for patients. In the civil sector, seismic engineers can exploit the damping characteristics of SMAs, combined with their superelastic behavior, to suppress or reduce earthquake effects.

We hope this book will attract new scientists to SMAs and inspire some colleagues to imagine the further expansion of SMA applications. As that engagement results in the novel benefits of that technology for the worldwide community, we will have achieved our objective.

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