Arch. Mech., **51**, 6, pp. 647–649, Warszawa 1999

Preface

The present issue of Archives of Mechanics contains the submitted and reviewed contributions to the Polish-Japanese Workshop on "B Testing and Modelling the Behaviour of Shape Memory Alloys", which was organised as an accompanying event at the 32nd Solid Mechanics Conference: SolMec '98, held in Zakopane, September 1 – 5, 1998.

History of scientific co-operation between Poland and Japan is long and close in the field of mechanics. Already in 1970s Prof. P. Perzyna and Prof. S. Murakami started together the investigations of creep phenomena, reaching finally the concept of damage mechanics. On the other hand, Prof. A. Sawczuk, Prof. B. Raniecki and Prof. T. Inoue have developed the foundation of quenching stress analysis that accounts for the effect of plastic flow and phase distortions due to martensitic and diffusive phase transformations in steels. It opened the way to a quite new field in applied thermomechanics. These pioneering co-operative works were frequently followed by many researchers in both countries, who have been developing, year by year, the closer and stronger scientific tie-up in the wider field of mechanics.

The chairmen of the present workshop have agreed in 1995 to start, together with Prof. L. Dietrich and Prof. S. Miyazaki, a Polish-Japanese co-operative research project under the theme "Testing and Modelling the Behaviour of Shape Memory Alloys", in order to verify the theory of pseudoelasticity in shape memory alloys presented by them in 1992 with French colleague Prof. C. Lexcellent. They prepared thin-walled tubular specimens in TiNi shape memory alloy for a series of tests under multiaxial stresses, covering the temperature range from the R-phase reorientation process to the martensitic transformation. Modelling the alloy behaviour, based fully on thermodynamics, was also included to the aims of their project. The informal co-operation between Prof. W.K. Nowacki and Prof. H. Tobushi initiated in 1996 in the field of mechanics of shape memory alloys should also be mentioned.

In fact such co-operative works were just an urgent request of the times; shape memory alloys were about to be used, not only as thin wires or coils but also as thin films of the order of mm in thickness, large pipes and bars of the order of scores of cm in diameter, fillers in a matrix material to form shape memory alloy composites, etc. Designers of the shape memory devices requested a sound theoretical framework to predict rationally the alloy performance, both under multiaxial stresses and in the wider temperature range. Theoretical concepts, which have been so far developed on macroscopic and microscopic ground

should be verified in the course of systematic and well designed experiments. The task is, however, quite difficult because the behaviour of shape memory alloys under thermomechanical loadings are extremely complex when compared to the performance of standard alloys.

The activity of the Polish-Japanese teams was adopted as one of the joint projects of the Polish Academy of Sciences and the Japan Society of Promotion of Sciences, who offered the teams a chance to hold the Workshop. Seven Japanese and twenty two Poles participated in the Workshop and discussed intensively, together with eight scientists from four countries, the topics reported on experimental results, mechanical and thermal, so far obtained in the project and proposals of data processing and model building. The thermomechanical behaviour in other alloy systems, such as Cu-based shape memory alloy and Fe-based shape memory alloy, was also presented.

As the chairmen of the Workshop, we sincerely wish that the present issue will become something like a forum of the researchers who have interest in the subject. The readers might hopefully find out in this forum some hints for their current and future study. And some new co-operation might be promoted in the forum.

Finally, we express our cordial thanks for the financial aid of the Polish Academy of Sciences, Polish State Committee for Sciences (project KBN No 7T07A00513) and the Japan Society of Promotion of Sciences, and also for the generous support of the office of the SolMec '98.

Bogdan Raniecki and Kikuaki Tanaka

Workshop Chairmen