Preface

The collective monograph “Shape memory alloys: properties, technologies, opportunities” presents the scientific results obtained by leading scientific teams studying shape memory alloys in former Soviet Republics during the last decade. The scientists from Russia (Moscow, Saint Petersburg, Ekaterinburg, Chelyabinsk, Tomsk), Ukraine (Kiev) and Belarus (Vitebsk) together with their colleagues from other countries made contributions to prepare this monograph.

The collective monograph consists of five parts covering of all aspects of shape memory alloys from theory and modelling to applications. The first part is devoted to the theory of martensitic transformations and the modelling of functional properties of shape memory alloys. New methods for the simulation and prediction of the behaviour of shape memory alloys under different stress – temperature regimes are described. The wave model for the description of martensite crystal growth at different sequences of martensitic transformations and the analysis of recent achievements in theoretical description of phase transformation in Heusler alloys are presented. The second part is devoted to the physical basis for the development of shape memory alloys, including unique properties such as high-temperature shape memory alloys, high-strength single crystals of shape memory alloys and ferromagnetic shape memory alloys. The third part is devoted to the methods for controlling functional properties of shape memory alloys by thermomechanical treatment, warm deformation, electroplastic deformation, high strain rate loading, ultrasonic vibration and neutron irradiation. The fourth part is devoted to the study of martensitic transformation and shape memory effects in special objects such as porous alloys, thin ribbons, high-strength precipitation-hardening austenitic steels and alloying TiNi-based alloys. Finally, the fifth part contains a review of shape memory alloy applications in Russia.

All chapters were peer-reviewed by expert referees. As the guest editors of the volume, we are grateful to the authors who prepared the chapters. We wish to acknowledge all those who reviewed the papers submitted to the monograph.

Dr. Natalia Resnina
Saint-Petersburg State University,
Saint-Petersburg, Russia

Prof. Vasili Rubanik
Institute of Technical Acoustics of
National Academy of Sciences of Belarus
Vitebsk, Belarus