

Preface

The ideas of this book emerged from the experience of the author with student courses on high temperature materials and on nuclear materials performed at the Swiss Federal Institutes of Technology in Zürich and Lausanne. Particularly the creation of the new Swiss Master of Nuclear Engineering demonstrated the need for a comprehensive introduction into structural nuclear materials with specific emphasis on engineering aspects. An introduction into structural materials operating in extreme environments is a real challenge because of the variety of topics involved. This is true for nuclear applications, but it also concerns materials for turbines, boilers, vessels or pipes necessary for non-nuclear plants or components. Understanding of the behaviour of components and possible damage includes information about microstructure, materials mechanics, fracture mechanics, influence of environment (radiation, corrosion) but it also needs basic knowledge about design, production, shaping and non-destructive testing. And finally in almost all cases economic considerations decide about introduction of new materials. The students usually have very different educational backgrounds and the majority of them knows only very little about materials, materials mechanics and related topics and it is therefore important to touch also upon elementary questions of materials science as a basis for better understanding.

Personal experience with nuclear engineers working in power plants or in design code related environments indicated that also from their side a broader introduction into the subject of structural nuclear materials would be appreciated.

When Switzerland entered the international Generation IV initiative in 2004 I became Swiss representative in the Very High Temperature Reactor (VHTR) Systems Steering Committee and I was also co-chair of the VHTR Project Management Board Materials which provided a thorough insight into relevant structural materials problems in advanced nuclear plants.

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