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R. Lässer

# Tritium and Helium-3 in Metals

With 77 Figures

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## Preface

Hydrogen can behave as an alkaline metal or a halogen and can react with nearly all elements of the periodic table. This explains the large number of metal hydrides.

Since T. Graham's first observation of the absorption of hydrogen in palladium in 1866 the behaviour of hydrogen in metals has been studied very extensively. The interest was motivated by the possible application of metal-hydrogen systems in new technologies (e.g., moderator material in nuclear fission reactors, reversible storage material for thermal energy and large amounts of hydrogen) and by the fact that metal hydrides show very exciting physical properties (e.g., superconductivity, quantum diffusion, order-disorder transitions, phase diagrams, etc.). Many of these properties have been determined for the stable hydrogen isotopes H and D in various metals. In comparison, very little is known about the behaviour of the radioactive isotope tritium in metals.

This book is a first attempt to summarize part of the knowledge of tritium gained in the last few years. In addition to the task of presenting the properties of tritium in metals, I have tried to compare these data with those of protium and deuterium. Furthermore, helium-3 is connected inseparably with tritium via the tritium decay. Therefore one chapter of this book is solely devoted to the curious properties of helium in metals caused mainly by its negligible solubility.

The book also treats general aspects of tritium such as its inventory on earth, its natural and man-made production paths, its release to the environment, incorporation in the body, handling, etc.

It was not my intention to present all the data on tritium in metals and I am aware of the fact that I have not discussed such interesting problems as the application of hydrogen-isotope separation in metals, the use of T in nuclear warheads to boost the energy release, etc. I would like to apologize to all colleagues whose work I did not mention.

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R. Lässer

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