

Forward

In 1937, Pfeil [1] discovered that trace additions of oxygen active elements like Y, La, and Ce to alloys that form chromium or aluminum oxide scales upon exposure at high temperatures have a very strong beneficial effect on the oxidation behavior of these materials. Specifically in the case of chromia formers, it was found that additions of these so-called "reactive-elements" reduced the growth rate of the oxide layer and enhanced the adhesion of the oxide layer to the base alloy, whereas in the case of alumina formers, the growth rate is not affected. This effect has become known as the "reactive-element effect." In his patent, Pfeil commented that the mechanism of this effect was not understood. After fifty years, substantial progress has been made to elucidate the mechanisms of this important effect, however important questions still remain open.

This book is an effort to collect in one reference, most of our current understanding of the reactive element effect. Dr. Norman Peterson proposed the idea for this book at the Gordon Research Conference in 1985. Peterson died in 1986 shortly after moving from Argonne National Laboratory to the University of Illinois. The completion of the book was delayed further by my departure from Argonne National Laboratory to Lawrence Livermore National Laboratory in 1987. Despite these delays, I believe that this reference will be particularly useful because of the broad treatment of the problem and the valuable summaries of French and Japanese work.

Unfortunately, not all of the important work on the reactive element effect is represented in this text. I therefore cite some pertinent additional references for the reader [2-11].

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