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Book review

High Chromium Ferritic and Martensitic Steels for Nuclear Applications – R. Klueh and D. Harries

ASTM has recently published the monograph 'High Chromium Ferritic and Martensitic Steels for Nuclear Applications' by Ronald L. Klueh and Donald R. Harries. The monograph is a comprehensive review of the state of understanding of (largely) 7–12 wt% chromium steels that are currently being considered as candidate materials for structural applications (first wall and blanket) in fusion reactors.

The monograph begins with a review of the history of the development of this class of steels, followed by chapters on their physical metallurgy, thermal stability, chemical resistance, and weldability. Following a brief description of radiation damage processes and irradiation facilities, the last half of the monograph is devoted to systematically considering the effects of irradiation (mostly neutron, but ion and electron irradiation are included) on microstructure, dimensional stability (swelling and creep) and mechanical properties (tensile, impact, fracture toughness, and fatigue). It concludes with a chapter on recovery of properties following post-irradiation annealing, and a summary of the status and future direction of developing these steels for fusion applications.

It is largely written as a literature review. As such it is chock full of useful summary tables, representative micrographs and results. Extensive bibliographies are included at the end of each chapter. Where the authors have attempted to summarize the literature and present a tutorial to the reader (for example, the theory section in the chapter on irradiation creep), the text is well written and easy to follow. Occasionally, however, the authors lapse into a paper-by-paper review of the literature. Here the presentation can be confusing to the uninitiated. Because the literature is full of conflicting data and interpretations, a reader unfamiliar with the literature and subject matter can get lost in the details of this argument–counter-argument approach. Be that as it may, the authors do attempt to provide a summary at the ends of most of the sections. The authors also make a concentrated effort to note where lack of understanding or unresolved issues remain.

Because the majority of the monograph deals with effects of neutron irradiation on these steels and the implication of their behavior to their applications in fusion reactor design, the monograph is likely to have limited value to those outside the fusion community. However, for those working in the realm of fusion reactor materials or fusion reactor design, this would be a very handy reference book to keep in one's library. It will certainly be in mine.

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