日本金属学会九州支部・日本鉄鋼協会九州支部

第 306 回材料科学談話会のお知らせ

平成 26 年 10 月 30 日

チェコ科学アカデミー・物理研究所の Pavel Lejček 教授をお招きして、下記のように講演会を開催いたします。 皆様、奮ってご参加下さい。

【講　　師】： Prof. Pavel Lejček

（Institute of Physics, Academy of Sciences of the Czech Republic）

【講演題目】： Grain boundary segregation and embrittlement

【日　　時】： 平成 26 年 11 月 11 日 (火), 14 時 30 分～16 時 00 分

【会　　場】： 熊本大学工学部研究棟Ⅰ ３階　３０８教室

【要　　旨】： One of the most dangerous technical failures of materials is intergranular brittle fracture (temper embrittlement) as it runs very quickly and its appearance is sometimes hardly predictable. It is known that this phenomenon is closely related to the chemistry of grain boundaries and to the difference of the segregation energies of the grain boundaries and the free surfaces (Rice–Wang model). To elucidate the effect of individual solutes on embrittlement of various base materials such as steels and nickel-base superalloys, grain boundary and surface segregation was extensively studied in many laboratories. As a result, numerous data on surface and grain boundary segregation have been gathered in literature. They were obtained in two main ways, by computer simulations and from experiments. Consequently, these results are frequently applied to quantify the embrittling potency of individual solutes. Unfortunately, many values of the segregation energy of a solute at grain boundaries as well as at surfaces obtained by various authors sometimes differ by more than one order of magnitude: such a difference is unacceptable as it cannot provide us with representative view on the problem of material temper embrittlement. In some cases it seems that these values do not reflect physical reality. Due to this large scatter of the segregation and embrittlement data a critical assessment of the literature results is highly needed which would enable the reader to avoid both the well known and less well known pitfalls in this field. In the present talk the available data on interfacial segregation and embrittlement of various solutes in nickel and bcc iron are summarized and their reliability, assessing also limitations of individual approaches employed to determine the values of segregation and strengthening/embrittling energies are critically discussed. It is shown that experimental methods have serious limitations which can be overcome by accepting reasonable assumption and models. On the other hand, the theoretical approaches are also restricted by the size of the computational repeat cell used for the calculations. In both cases the determined segregation energy and/or enthalpy provides us with reliable data only if physical reality is reflected.

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