S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES
Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Condensed Matter and Materials Physics

27th April,2023 **4.00 PM** **ONLINE/ FERMION**

SPEAKER

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TITLE OF THE TALK

HYDROGEN INTERPLAY WITH DEFECTS IN AL ALLOYS

ABSTRACT

Al alloys are used as major structural material in the aviation and more recently, automobile industries. This demands detail research of microstructural defects generated while usage. We have performed density functional theory calculations to study the competition of microstructural features including grain boundaries and second phase particles. The results reveal second phases as better trapping sites since H has a higher solubility compared to the GBs.

However, it is seen that certain solutes such as Mg enhances the chance of HE at the forming surface during crack initiation. This is further supported by experimental data where a high strength 7xxx Al alloy is charged by deuterium using atom probe tomography (APT). Subsequently, we have extended our study to several other alloying elements such as Sc, Sn and Zr, at the GB which are inevitably present as impurities in technical alloys. Interestingly, it is seen that Sn strongly binds with H at the GB without increasing the embrittling tendency. Based on these insights, effective alloying strategies can be developed to improve the resistance to hydrogen embrittlement.

Reference: Hydrogen trapping and embrittlement in high-strength Al-alloys.
H. Zhao, P. Chakraborty, D. Ponge, T. Hickel, B. Sun, C.- H.Wu, B. Gault and D. Raabe, Nature 602, 437 (2022).

HOST FACULTY

Prof. Tanusri Saha Dasgupta, Senior Professor

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