

INDIAN INSTITUTE OF TECHNOLOGY MADRAS
DEPARTMENT OF METALLURGICAL & MATERIALS ENGINEERING

APDIC Report 2023

Compiled by K.C. Hari Kumar

The department has nearly 30 faculty members, who specializations are varied. Several of them uses phase diagram information in their research. We have only limited number of research programs that focusses on experimental determination of phase diagrams. However, we are one of the few departments in the country that has an active research group on computational materials thermodynamics (CALPHAD). Following is the summary of activities worth reporting to APDIC.

Workshops conducted (1)

1. Thermo-Calc Hands-on Training Course (12 h of training sessions), Organized by Department of Metallurgical & Materials Engineering, IIT Madras, in collaboration with Bhanu Scientific Systems Pvt. Ltd., Hyderabad, Jan 17–19, 2023. Nearly 20 participants from Vikram Sarabhai Space Centre participated in the program.

Publications (7)

1. R. Gupta, S. Bhowmick, K.C. Hari Kumar, M. Prasad, P. Pant, “Transformation of borides in directionally solidified nickel base superalloy and its mechanical response”, Journal of Alloys and Compounds, 952, 169996(2023).
<https://doi.org/10.1016/j.jallcom.2023.169996>
2. C Zhong, VP Narayana Samy, N Pirch, A Gasser, G Phanikumar, “Heat Treatment Design for IN718 by Laser Metal Deposition with High Deposition Rates: Modeling, Simulation, and Experiments”, 3D Printing and Additive Manufacturing 10(1), 136-

145 (2023).

<https://doi.org/10.1089/3dp.2021.011>

3. VS Hariharan, Baler Nithin, L Ruban Raj, Surendra Kumar Makineni, BS Murty, Gandham Phanikumar, “Modeling microsegregation during metal additive manufacturing: Impact of dendrite tip kinetics and finite solute diffusion”, Crystals 13 (5), 842(2023).

<https://doi.org/10.3390/cryst13050842>

4. U Hussain, G Phanikumar, N Swaminathan, “Mapping of multiphase field model parameters to physical factors in order to simulate desired phase transformations” , Computational Materials Science 226, 112227(2023).

<https://doi.org/10.1016/j.commatsci.2023.112227>

5. A Bansal, P Kumar, S Yadav, VS Hariharan, MR Rahul, G Phanikumar, “Accelerated design of high entropy alloys by integrating high throughput calculation and machine learning”, Journal of Alloys and Compounds 960, 170543(2023).

<https://doi.org/10.1016/j.jallcom.2023.170543>

6. Master's Thesis, "Thermodynamic Modeling of MAX Phase Containing Nb-Al-C system", P. Thanooj, 2023.
7. Master's Thesis, "Thermodynamic Analysis of Phase Stability of High Entropy Alloys", Chakka Sai Sri, 2023.

Thank You