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Advancing High-Entropy Materials through Surface Coating Technology

Abstract
High-entropy materials (HEMs), with their vast compositional design space and tunable phase stability, are emerging as advanced candidates for applications across harsh environments. HEMs as functional surface coatings via thermal spray or laser deposition open an economic development avenue for extreme environments. This work highlights recent progress in HEM coatings, showing how composition control and rapid-solidification pathways govern phase selection, microstructure, and mechanical response, and thereby wear, oxidation, and corrosion behaviour. CALPHAD-guided design, including Scheil simulations for non-equilibrium processing, is coupled with experimental validation to link processing, microstructure and performance. The study also provides an outlook on circular feedstock design, leveraging critical alloy inputs, to deliver sustainable HEM powders tailored for surface engineering.

Biography
Dr Ashok Meghwal is the CTO and co-founder of EntroMat Pty Ltd (Australia), leading the commercialisation of sustainable high-entropy material (HEM) powders. He received his PhD (2018) from Swinburne University of Technology under Distinguished Professor Christopher Berndt and A/Prof Andrew Ang, focusing on novel thermal-spray coatings for extreme engineering environments. A former research engineer and now an Adjunct Research Fellow at Swinburne, his work centres on HEM design, powder development, and CALPHAD-driven processing for surface coatings. His interests span processing–structure–property relationships, oxidation and wear, and sustainable HEM manufacturing.