World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:18, No:07, 2024

Superior Wear Performance of CoCrNi Matrix Composite Reinforced with Quasi-Continuously Networked Graphene Nanosheets and In-Situ Carbide

Authors : Wenting Ye

Abstract : The biological materials evolved in nature generally exhibit interpenetrating network structures, which may offer useful inspiration for the architectural design of wear-resistant composites. Here, a strategy for designing self-lubricating medium entropy alloy (MEA) composites with high strength and excellent anti-wear performance was proposed through quasi-continuously networked in-situ carbides and graphene nanosheets. The discontinuous coating of graphene on the MEA powder surface inhibits continuous metallurgy bonding of the MEA powders during sintering, generating the typical quasi-continuously networked architecture. A good combination of mechanical properties with high fracture strength over 2 GPa and large compressive plasticity over 30% benefits from metallurgy bonding that prevents crack initiation and extension. The wear rate of an order of 10-6 m3N-1m-1 ascribing to an amorphous-crystalline nanocomposite surface, tribo-film induced by graphene, as well as the gradient worn subsurface during friction was achieved by the MEA composite, which is an order of magnitude lower than the unreinforced MEA matrix.

Keywords : in-situ carbide, tribological behavior, medium entropy alloy matrix composite, graphene
Conference Title : ICMSE 2024 : International Conference on Materials Science and Engineering
Conference Location : Tokyo, Japan
Conference Dates : July 22-23, 2024