

Keynote Lecture

Title	Prof.	First Name	Kee-Ahn	Last Name	Lee
Affiliation			Inha University		
Presentation Title			Fe-Ce-Mo based metamorphic alloy coatings with excellent wear and corrosion resistances fabricated via thermal spray process		
Biography			<p>Education</p> <p>1993.02: Bachelor, Dep. of Mater. Sci. & Eng., KAIST (Korea Advanced Institute of Sci. and Tech.)</p> <p>1995.02: Master, Dep. of Mater. Sci. & Eng., POSTECH (Pohang University of Sci. and Tech.)</p> <p>1999.02: PhD, Dep. of Mater. Sci. & Eng., POSTECH (Pohang University of Sci. and Tech.), Korea</p> <p>Professional Experience</p> <p>2024.01– present : President, KTSA (Korean Thermal Spray Association), Korea</p> <p>2022.01– present : Executive Vice President, KPMI (Korean Powder Metallurgy & Materials Institute), Korea</p> <p>2025.01– present : Vice President, KIM (Korean Institute of Metals and Materials), Korea</p> <p>2017.03– present : Professor, Dep. of Materials Science & Engineering, Inha University, Korea</p> <p>2005.03–2017.02 : Professor, Dep. of Materials Science & Engineering, Andong National University</p> <p>2009.02–2010.01 : Visiting Professor, UCF (University of Central Florida), USA</p> <p>2001.01–2005.02 : Senior Researcher, RIST (Research Institute of Industrial Sci. & Tech.), Korea</p> <p>1999.12–2001.01 : Post Doc. Fellow, MIT (Massachusetts Institute of Technology), USA</p> <p>* Published papers ~ 340, H-index 40</p>		

Abstract

A cost-effective Fe-Cr-Mo based metamorphic alloys were newly designed and fabricated as coating material using the high-velocity oxygen fuel (HVOF) and atmospheric plasma spray (APS) thermal spray processes, and its microstructure, wear resistance, corrosion resistance were investigated in comparison with a conventional HVOF WC-12Co coating. The metamorphic coating material consisted of a splat area and un-melted powder area. The splat area contained metallic glass, $(\text{Cr,Fe})_2\text{B}$, Cr_2B , and minor Fe-based BCC phases, and the un-melted powder area was composed of Fe-based BCC, $(\text{Cr,Fe})_2\text{B}$, and Cr_2B phases. Room-temperature wear tests revealed that HVOF metamorphic coating material exhibited wear resistance comparable to HVOF WC-12Co coating and even superior performance at high-stress wear conditions. The corrosion resistance of APS metamorphic coating material significantly improved by addition of Mo and Nb elements. This superior wear behavior of metamorphic coating material was mainly attributed to the minimal hardness difference between the metallic glass and boride, the plasticity of the metallic glass, and the formation of a lubricating tribofilm. Based on the above results, the wear and corrosion mechanisms of Fe-Cr-B based metamorphic alloy coating layers were also discussed.