Co-Fe-Ni Alloy Development Using Laser Engineered Net Shaping (LENS)

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With increasing emphasis on electrification, so too is the demand for better soft magnetic alloys in terms of both magnetic and mechanical performance. However developing new alloys with conventional means is both expensive and time intensive, making it impractical to conduct a comprehensive and thorough screening of all compositions. The current advances in Additive Manufacturing to quickly manufacture compositionally graded bulk alloy structures combined with fast characterization techniques now offers a new paradigm in alloy discovery. In this work, Laser Engineered Net Shaping (LENS) process was used to quickly fabricate graded combinations of the three elemental metals: Cobalt, Iron and Nickel. These were then quickly screened for their mechanical and magnetic properties; of which compositions with superior mechanical strength were identified and separately fabricated and tested. Close relation between screened properties from compositionally graded structures with that of tested properties of compositionally homogenous structures demonstrates the advantages of Additive Manufacturing in alloy discovery. This work is supported by the AME Programmatic Fund by the Agency for Science, Technology and Research, Singapore under Grant No. A1898b0043.