

# Ambient pressure fabrication of Nickel-free high nitrogen austenitic stainless steel using laser powder bed fusion method

Baisong Cheng, Fengxia Wei, Wei Hock Teh, Jing Jun Lee, Li Tian Chew, Kok Heng Cheong, Desmond Lau, Chee Koon Ng, Pei Wang, Cheng Cheh Tan

Institute of Materials Research and Engineering

## Abstract:

Conventional Austenitic Stainless Steel (CASS:8.0-14wt% Ni) has been widely used in the industry because of its excellent mechanical property and corrosion resistance. Moreover, in recent years the industry has also carried out a large number of research and applications on the additively manufactured CASS, further broadening the application scope of CASS. However, with the increasing use of CASS and the rising price of Ni, the large-scale application of CASS is being challenged by raw materials cost. There is an urgent need for cheap austenitic stainless steel to meet the market demand. In view of this, IMRE invented a method to manufacture Ni-free high-nitrogen(0.87wt%) austenitic stainless steel at ambient pressure using laser powder bed fusion technique. Not only can the cost of raw materials be greatly reduced, but also the performance can be greatly improved. More than 70% improvement in hardness and ~59% increase in yield strength compared to the laser powder bed fusion fabricated SS316L. This technology will greatly promote the application of nickel-free austenitic stainless steel in engineering structures, medical devices and bioimplants. This work is supported by the AME Programmatic Fund by the Agency for Science, Technology and Research, Singapore under Grant No. A18b1B0061.