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High nitrogen steels by Si₃N₄ additivated steel powders

Additive manufacturing (AM) processes are gaining significant traction in various industries. The metal Binder Jetting (MBJ) process is particularly well-suited for high productivity and the production of highly complex components. However, the range of materials available for MBJ remains limited, presenting a substantial opportunity for further research. In particular, the use of powder mixtures and in-situ alloying techniques offers nearly limitless possibilities for material selection.

This study introduces a novel approach for the creation of high nitrogen steels (HNS) using Si₃N₄ additivated metal powders in combination with AM and hot isostatic pressing (HIP). The newly developed metal powder, X15CrMnMoNi17-11-3, was fabricated through MBJ. Microstructural analysis revealed an unintended duplex-steel microstructure and the formation of a third, undefined phase. This poster will present a novel approach in which Si₃N₄ particles are added with the aim of increasing the nitrogen content after HIP, thereby stabilizing the austenitic matrix structure, suppressing the formation of other phases, and simultaneously enhancing the mechanical properties of the material.

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