Fluids and Space Engineering Seminar

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Online

Additive core manufacturing of soft magnetic material for future space applications

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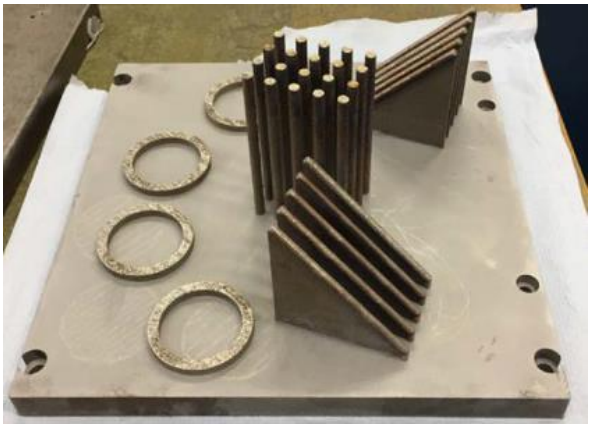
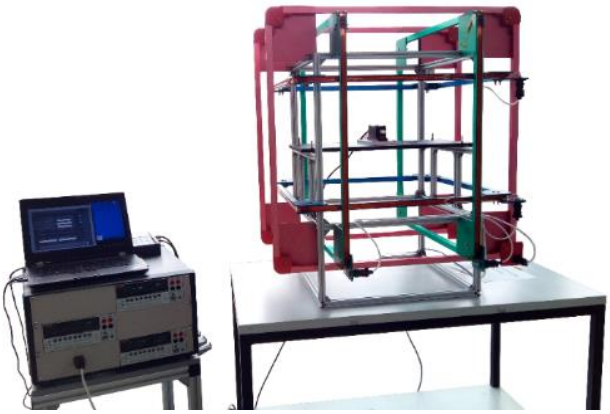


Additive manufactured soft magnetic cores



Helmholtz coil set-up for magnetic torsion measurement

A high degree of design freedom, direct production of a CAD model, no investment in tools and minimal use of materials are all advantages of additive manufacturing. This new production variant has great potential for magnetic applications such as stepper motors, magnetic shields or magnetic coils on satellites. Especially powder bed laser fusion is very interesting process because high mass density can be achieved, which is important for the magnetic properties.

In a feasibility study semi-finished products made of a soft magnetic nickel-iron alloy were produced and analyzed. For this purpose, the metal powder was analyzed using several measuring methods, the first manufacturing parameters were determined and finally coil cores were manufactured which were magnetically characterized by a torsion measurement. Also mechanical strength and the surface quality were evaluated.

Furthermore, an outlook is given on how this new manufacturing possibility can be used for complex magnetic systems. The lecture presents results of the DLR project MAddiKe – Machbarkeitsprüfung zur additiven Kernfertigung von weichmagnetischem Material / Feasibility test for additive core production of soft magnetic material (funding number 50RR1705) and the ESA project RIMONA - Reaction wheel rotor with Integrated MagNetic bearing using additive manufacturing - (contract number 4000124501/18 / NL / MH / mg).