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Publisher's version / Version de l'éditeur:

<https://doi.org/10.4028/www.scientific.net/MSF.706-709.813>

Materials Science Forum, 706-709, pp. 813-818, 2011-08-01

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SINTERED LAMELLAR SOFT MAGNETIC COMPOSITES: Shaping and Magnetic Properties

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Sintered lamellar soft magnetic composite (SL-SMC) is a promising material for power frequency applications and for induction motors. Alumina coated Fe-3%Si particles cut from steel sheets offers both the advantages of standard laminated steel and of soft magnetic composites. This material can be shaped using standard near-net shape powder metallurgy (P/M) technique, which is a big advantage over laminated steel. Indeed, P/M process, when compared to laminated steel, give access to better design, improve motor assembling techniques and lower production cost, by limiting machining and stamping. The unique structure of SL-SMC offers better DC magnetic properties than standard soft magnetic composites hence covering a larger range of applications. However, there is still some works to be done to show that this technology can reach his potential using low cost industrial techniques.

This study is divided into two main parts. The first one is dedicated to assess the possibility to produce parts using an automatic industrial compaction press. The impact of two different lubrication systems, admixed solid lubricant and die wall lubrication, on density and green strength will be determined. Also, the process capability will be evaluated using part to part stability. The second part of this study will determine the impact of different process parameter on mechanical and magnetic properties of the Fe-3%Si alloy. Results show that by carefully controlling heat treatment, very high maximum induction, low magnetic loss and good mechanical property can be reached.

TOPIC: Energy Materials

PRESENTATION: Oral