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**Lamarre et al.**(10) **Pub. No.: US 2024/0213834 A1**(43) **Pub. Date: Jun. 27, 2024**(54) **PERMANENT MAGNETS WITH  
INTEGRATED PHASE CHANGE  
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(57)

**ABSTRACT**

A permanent magnet (PM) for use in an electric machine including at least one cavity containing a phase change material (PCM) integrated with said PM, the PCM having a phase transition temperature between about 80° C. to about 200° C., and preferably a latent heat of at least 50 KJ/kg, wherein in PM, each cavity is a blind, elongated chamber extending from one side of the PM, having two smaller dimensions and a larger dimension of each cavity is oriented substantially in a same direction, wherein the PM is composed of a hard magnetic phase, a binder phase and PM having an ultimate tensile strength of at least 150 Megapascal (MPa), wherein PM is mounted on a rotor of an electric machine and is formed by cold spray additive manufacturing (CSAM)

