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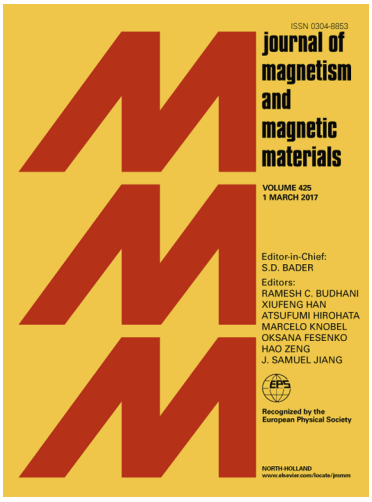

Controllable Hydrophobicity of Magnetoactive Elastomer Coatings

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Controllable Hydrophobicity of Magnetoactive Elastomer Coatings

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Abstract

A series of magnetoactive elastomer (MAE) coatings consisting of a silicone matrix and carbonyl iron particles (3 – 5 μm in diameter) have been synthesized and their hydrophobic properties have been investigated in various magnetic fields of disk-shaped permanent NdFeB magnets. Concentration of magnetic filler in MAEs has been varied in the range of 63 – 76 mass%. Both isotropic samples and structured samples synthesized in magnetic field of 80 mT have been obtained. It has been shown that application of a magnetic field induces structuring of the filler on the surface of MAE coatings, resulting in formation of mountain-like microstructures. Microstructure relief on coating surfaces leads to an increase of a water contact angle which could be varied from 110°±10° at zero field up to 163°±2° at 600 mT. The contact angle at the maximum field increases with iron filler content and with softening of the polymer matrix.
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Keywords: magnetoactive elastomer; magnetorheological elastomer; hydrophobic coatings; magnetic field

1. Introduction

Nowadays production of hydrophobic and superhydropobic coatings is extremely important due to their numerous applications owing to a large number of unique properties, in particular, resistance to corrosion and biofouling, watertightness [1,2]. The slip of the liquid flow is facilitated near hydrophobic and superhydropobic surfaces [3], besides, such surfaces can be used for self-cleaning and anti-icing applications [4,5]. There is a growing interest in studying mechanisms of wettability of solids and finding new methods for surface hydrophobization [6-9].

Usually if a certain surface can demonstrate

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