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Nanosecond laser micro- and nanotexturing for the design of a superhydrophobic coating robust against long-term contact with water, cavitation, and abrasion

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Abstract

Existing and emerging applications of laser-driven methods make an important contribution to advancement in nanotechnological approaches for the design of superhydrophobic surfaces. In this study, we describe a superhydrophobic coating on stainless steel, designed by nanosecond IR laser treatment with subsequent chemisorption of fluorooxysilane for use in heavily loaded hydraulic systems. Coating characterization reveals extreme water repellency, chemical stability on long-term contact with water, and excellent durability of functional properties under prolonged abrasive wear and cavitation loads. The coating also demonstrates self-healing properties after mechanical damage.

KEYWORDS: superhydrophobic coatings, nanosecond IR laser treatment, abrasive wear, cavitation loads, self-healing