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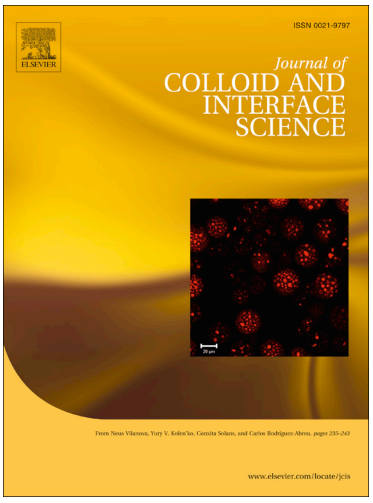

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Mechanical Stability, Corrosion Resistance of Superhydrophobic Steel and Repairable Durability of its Slippery surface

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Abstract

A simple way of chemical etching with H_2SO_4 and H_2O_2 was employed to prepare a superhydrophobic steel surface with a water contact angle of 163.5 ° and a sliding angle of about 0 °, in addition to modification with 1H,1H,2H,2H-perfluoroalkyltriethoxysilane (FAS-13). On the basis of perfluropolyethers (PFPE) infusion, a slippery liquid-infused porous surface (SLIPS) was fabricated that had a water contact angle of 115.6 ° and a sliding angle of 2.27 °. The prepared sample can still maintain superhydrophobicity after moving 100 cm on 1000 # sandpaper under 100 g loading via an abrasion test, while its corrosion resistance was exhibited via more positive corrosion potentials (E_{corr}) and lower corrosion current densities (I_{corr}) in electrochemical corrosion tests with various solutions. Even if superhydrophobic and slippery properties were lost in the process of long-time soaking in salt solution, the superhydrophobic steel could regain its ability and slippery surfaces also exhibited the repairable durability through retreatment. Such stable, corrosion resistant and superhydrophobic bearing steel and repairable slippery surface have potential for application in practical production and life.