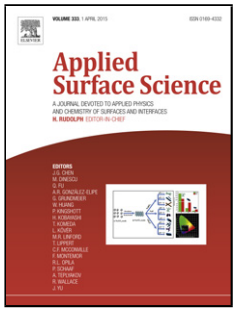

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Development of Durable Self-cleaning Coatings Using Organic-inorganic Hybrid Sol-gel Method

Divya Kumar[a], Xinghua Wu[a,b], Qitao Fu[a], Jeffrey Weng Chye Ho[a,b], Pushkar D. Kanhere[b], Lin Li[c], Zhong Chen[a,b,*]

a. School of Materials Science and Engineering, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798

b. Energy Research Institute at NTU (ERI@N), 1 CleanTech Loop, #06-04, CleanTech One, Singapore 637141

c. School of Mechanical and Aerospace Engineering, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798

* Contact email: ASZChen@ntu.edu.sg

Abstract

Self-cleaning coatings with excellent water-repellence and good mechanical properties are in high demand. However, producing such coatings with resistance to mechanical abrasion and environmental weathering remains a key challenge. Mechanically robust coatings based on tetraethylorthosilicate (TEOS) and glycidoxypropyltriethoxysilane (Glymo) have been prepared using a sol-gel method. Emphasis is given to the addition of Glymo, an epoxy silane which creates an organic matrix that blends with the inorganic Si-O-Si matrix formed from the TEOS. The combination of the blended matrix produced coatings with good adhesion to substrates and improved mechanical properties. Fluoroalkylsilane (FAS) and silica fillers were introduced to increase the hydrophobicity of the coating. It was found that the water contact angle (CA) of these coatings increases from 115° to 164° upon decreasing filler size from 1-5 μm to 10-20 nm. The sliding angle (SA) for coatings with 15 wt.% loading of 10-20 nm silica is around 2°. UV weathering does not show significant effect on the properties of the coatings. Mechanical properties and performances including hardness, Young's modulus, coating adhesion and