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Barrier mechanism of multilayers graphene coated copper against atomic oxygen irradiation

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Abstract

Graphene has been demonstrated as a protective coating for Cu under ambient condition because of its high impermeability and light-weight oxidation barrier. However, it lacks the research of graphene as a protective coating in space environment. Here, we experimentally and theoretically study the oxidation behavior of graphene-coated Cu in vacuum atomic oxygen (AO) condition. After AO irradiation, the experimental results show multilayer graphene has better anti-oxidation than monolayer graphene. Meanwhile, the calculation results show the oxidation appeared on the graphene's grain boundaries or the film's vacancy defects for the monolayer graphene coated Cu foil. Moreover, the calculation results show the oxidation process proceeds slowly in multilayers because of the matched defects overlaps each other to form a steric hindrance to suppress the O atom diffusion in the vertical direction, and the mismatched defects generates potential energy barriers for

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