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A parametric study of surface roughness and bonding mechanisms of aluminum alloys with epoxies: a molecular dynamics simulation.[1] RAJENDRA TIMILSINA, STEPHANIE TERMAATH, Univ of Tennessee, Knoxville — The marine environment is highly aggressive towards most materials. However, aluminium-magnesium alloys (Al-Mg, specifically, 5xxx series) have exceptionally long service life in such aggressive marine environments. For instance, an Al-Mg alloy, AA5083, is extensively used in naval structures because of its good mechanical strength, formability, seawater corrosion resistance and weldability. However, bonding mechanisms of these alloys with epoxies in a rough surface environment are not fully understood yet. It requires a rigorous investigation at molecular or atomic levels. We performed a molecular dynamics simulation to study an adherend surface preparation and surface bonding mechanisms of Al-Mg alloy (AA5083) with different epoxies by developing several computer models. Various distributions of surface roughness are introduced in the models and performed molecular dynamics simulations. Formation of a beta phase (Al_3Mg_2), microstructures, bonding energies at the interface, bonding strengths and durability are investigated.

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