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● Design of a test for thermo-oxidized adhesively bonded joints for aero-engines applications

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Abstract content

Over the past few years, interest of adhesively bonded assemblies has increasingly grown, especially in the aircraft industry due to their high strength/weight ratio. Several mechanical tests have been developed over the years to characterise the joints mechanical behavior ([1]). These tests have been optimized in order to obtain a uniform stress state within the adhesives ([1]) and to avoid any parasite effects promoted by stress concentrations. These classical tests have been also employed to assess the impact of humid ageing on mechanical behavior of adhesive joints ([2]), when water absorption is driven by diffusion and reaches saturation. In aircraft structures subjected to high temperatures (such as aero-engines), thermo-oxidative ageing phenomena may take place: in this case oxygen absorption is driven by diffusion-reaction and no saturation is achievable ([3]), leading to the development of oxidized affected mechanical properties gradients. Consequently, classical mechanical tests based on uniform loading are not adapted for such conditions.

This present work focuses on the development of a dedicated test for thermo-oxidized adhesively bonded joints for aero-engines applications, emphasizing the presence of oxidation gradients with the aim of assessing damage onset in such configurations: different bonded joints test configurations are compared and assessed using a dedicated numerical model ([3]), taking into account properties and stress gradients induced by thermo-oxidation.

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