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Using the 3-point bending method to study failure initiation in epoxide-aluminum joints.

Jean-Baptiste SAUVAGE^{a,b}, Maëlen AUFRAY^{a*}, Jean-Pierre JEANDRAU^c, Pierre CHALANDON^c, Dominique POQUILLON^a, Michel NARDIN^b

^a CIRIMAT, Université de Toulouse, 4 allée Émile Monso 31 030, Toulouse France

^b IS2M (CNRS-UMR7361), Université de Haute Alsace, 15 rue Jean Starcky 68 057, Mulhouse France

^c CETIM, 7, rue de la Presse, 42 952 Saint-Étienne France

*Corresponding author.

Tel: +33 5 34 32 34 42, email address: maelenn.aufray@ensiacet.fr, 4 allée Émile Monso 31030, Toulouse France

Abstract – The increasing use of adhesives in industry has boosted the search for tests which allow the adherence level to be defined. These tests, depending on the type of load, examine different stresses, failure modes and mixed modes. Furthermore, these tests can be focused either on initiation or propagation of adhesive failure. The subject of this study is the initiation of adhesive failure. The initiation of failure can be determined with the 3-point bending test. Trials of 3-point bending tests were conducted on an aluminum 2024 substrate, with two different thicknesses, in order to understand the impact of the adherend thickness. The aluminum substrate received different types of surface pre-treatment: acetone cleaning, hydrochloric acid etching or aminopropyltriethoxysilane coating. Two adhesives were used: the first one was a mixture of epoxy pre-polymer DGEBA and DETA amine, whereas the second was a commercially formulated adhesive, ELECOLIT 6604. The initiation of adhesive failure was obtained by 3-point bending test and verified with SEM analysis. The failure loads measured enabled the effect of surface treatment on adhesive failure to be revealed: the results

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