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Pre-bond Quality Assurance of CFRP-surfaces by using Optically Stimulated Electron Emission

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With increasing air travel, the need for a reduction of CO_2 emissions becomes more and more important. Hence, the implementation of carbon fiber reinforced plastics (CFRP) as light weight material for aircrafts structures was significantly increased in the past years. Regarding CFRP materials in aircraft structures, adhesive bonding techniques are used in manufacturing and repair processes. As CFRP surfaces are susceptible to contaminations during manufacturing processes and exposure to in-service environments surface monitoring is indispensable for the detection of adverse substances which could affect the mechanical properties of the joints. Optically stimulated electron emission (OSEE) is a technique that is able to detect different surface conditions (e.g. contaminants). In the present work, the OSEE technique was tested with regard to its applicability as surface monitoring tool for CFRP material prior to adhesive bonding. Samples with different surface qualities (clean reference and samples contaminated with moisture, hydraulic oil, release agent and samples exposed to thermal impact) were investigated and could be distinguished by their specific OSEE-signals. In an additional step, the reliability of the OSEE technique was evaluated. Charging of the samples during the measurements influences the OSEE signal and might thus lead to misinterpretation of the analytical results. The effect of sample charging on the measuring signals was assessed and different techniques were tested which can be used to neutralize or prevent sample charging.