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Surface analysis and adhesive properties of release agent free CFRP component manufacture using flexible release film

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Adhesives are extensively applied to join Carbon Fiber Reinforced Polymer (CFRP) components since for these type of material classical joining techniques such as bolting, screwing or riveting are considered to be source of weakness or fatigue, which can compromise its mechanical properties, beyond an excess of weight. However, as the bond strength is directly related to the presence of contaminants on the adherent surface, CFRP components must be free of release agents, which contain polymeric fluorinated hydrocarbons and/or silicones, in order to achieve the appropriate adhesive-bonded joints. Considering this context, researchers of Plasma Technology and Surfaces (PLATO) and experts in the Project Group Joining and Assembly FFM at Fraunhofer IFAM have developed a flexible deep-drawable release film, named Flex$^{PLAS®}$. The Flex$^{PLAS®}$ release film is an elastic polymer film with a flexible plasma-polymer release layer that allows easy and clean removal of CFRP components from metal molds, both male and female, without the need for apply any release agents. Thereby, there is no downtime required to thoroughly cleaning the CFRP parts as well as molds from release agent residues, besides reducing the risk of defects in coating and adhesion. This technology has already been used to manufacture large CFRP components on a 1:1 scale, via a prepreg process at 180 °C in an autoclave. It can also be used for other manufacturing processes such as the (vacuum) infusion process or the wet layup process. Furthermore, if the release film remains on the component to the end of the process or up to delivery to the final customer then it also acts as a protective film. On the CLBA conference 2012, the speaker will present an overview of this plasma coating development carried out at Fraunhofer IFAM and the applications field for release films. Additionally, the presentation will cover the surface analysis of release film and finished carbon fiber material as well as the adhesive interaction between the interface of CFRP and the release film, measured through peel strength tests.