ON THE BONDING STRENGTH DEGRADATION BY HUMIDITY OF DIFFERENT TITANIUM-PEEK INTERFACES

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ABSTRACT

Fibre Metal Laminates (FML) consisting of alternating stacked layers of polymer matrix composites and metallic foils are considered for structures with high fracture toughness and good impact resistance in aeronautical applications. In comparison to GLARE® (Glass fibre reinforced aluminium) carbon fibre reinforced polymers combined with titanium foils offer higher strength and stiffness. When using thermoplastics for the matrix, further advantages such as formability, weldability and environmental friendliness arise.

Therefore, the properties of Ti/CF-PEEK laminates are under investigation at DLR. However, degradation of the bonding strength between the PEEK matrix and titanium is an issue. Especially humidity is a critical factor for the aging of Ti/CF-PEEK laminates. Several surface pre-treatments of the titanium layers were tested to improve the long-term behaviour of the interface. Techniques considered are listed in table 1.

To compare the different surface treatments specimens were prepared and partly annealed in hot water (80°C). Tensile and shear tests were conducted to determine the degradation of the initial strength by the influence of the water. The paper provides an overview of the tested surface treatments and their stability against water.

Table 1: Overview of titanium surface pre-treatments used for Ti-PEEK interface investigations

<table>
<thead>
<tr>
<th>Physical</th>
<th>Chemo-physical</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand blasted</td>
<td>Acidic anodized</td>
<td>Silan coated</td>
</tr>
<tr>
<td>Ground</td>
<td>Alkaline anodized</td>
<td>Titanate coated</td>
</tr>
<tr>
<td>Laser peened</td>
<td></td>
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