

The Influence of Silicon in EN AW 6082 Alloys on the Bond Strength in Cold Pressure Welding

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Abstract. Metallurgical joining of steel and aluminum has become a field of interest in research in the last years, as it will allow the production of load adapted lightweight components in the future. The production process of cold extrusion enables both, forming and joining at the same time obtaining high bond strengths in the final component. However, the reachable relative bond strength varies highly between different material combinations. A very promising combination is steel and aluminum which is why here the commercially available 1.0401 and EN AW 6082 alloy are joined. This presented paper focuses especially on the influence of the silicon amount in EN AW 6082 and thus the influence on the reachable bond strength. The silicon content was varied between 0.7 and 1.3 wt %, while the magnesium content was kept constant at 0.6 wt %, which is within the range of the specifications of the commercially available alloy. Before joining, the materials were aged to their T6 state as well as a state of similar hardness for each silicon content. The results show a significant influence of the silicon, as only joints produced with the material with higher silicon content reach bond strengths of 150 MPa. Differences in the material flow and hardness increase were also observed due to the deformation of the joined components. For further understanding of the mechanism behind these observations, FE-simulations were conducted to show the material flow and therefore the reasons for the different strengths and geometries.