

Which Properties must a Surface have to be suitable for Cold Pressure Welding?

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Abstract. Cold pressure welding is a very promising welding technology, as different materials can be joined without brittle intermetallic phases in the bond zone. During an extrusion process local contact conditions are caused which can generate this type of metallurgical joint. Special surface preparations can enhance this formation of metallic bonds to result in high overall component strengths. So far, for the material combination of steel and aluminum scratch brushing was analyzed as especially beneficial due to the thereby formed brittle cover layer and the cleaning effects. Within this paper, the relevant declared surface conditions as the amount of contamination and oxide layer thickness are analyzed by the means of X-ray photoelectron spectroscopy (XPS) method. Because plasma treatments are known to influence these parameters, a polished reference sample and an argon (physical removal) as well as oxygen plasma (chemical removal) prepared surface is joined. These samples are micro tensile tested to measure the local bond strength. The results are related to the measured contaminations, which were significantly reduced by the plasma treatment and therefore the bond strength increases. Due to the fact that the surface tension is influenced as well, the resulting tensions were further analyzed to take the effect of the adhesion energies into account by the Owens, Wendt, Rabel und Kaelble (OWKR) method.