Use of Zinc-Alloys for Low Temperature Soldering of Zinc Coated Steels

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Abstract. Zinc coated steels are nowadays used for different applications as for example for household appliances, automotive or offtakes. Due to the boiling temperature of zinc (907°C), which is lower than the steel melting point, the welding of zinc coated steel sheets presents many difficulties. As a result of the violent evaporation of zinc, pores in the weld seam are present after solidification and the zinc coating near the weld is damaged. Brazing of zinc coated steels with CuSi-alloys offers some advantages, as the joining temperature is about 950-1000°C. Nevertheless the high melting point of these filler materials requires very restricted process strategies and damaging of the zinc coating near the brazing seam can't be avoided. Although laser-, plasma- and MIG-joining with CuSi and CuAl are performed nowadays. ZnAl-alloys are characterized through low melting temperature, which are comparable to the melting point of zinc, so that the damaging of the zinc coating can be reduced.

In this paper investigations carried out with ZnAl-materials for joining zinc coated steel sheets as DC04ZE75/75 and DX56Z (thickness 0,9 mm) are reported. First investigations were performed by resistance spot soldering and show that using low temperature melting materials leads to a lower damaging of the zinc coating.

Further the process reliability of laser soldering with ZnAl-alloys and a Nd:YAG as well as a diode laser is reported and confirms the suitability of these alloys for a damaging free joining zinc coated steels. The low surface tension leads to a wide bearing section, so that advantageous properties are expected. The mechanical properties of edge welds are evaluated in this paper through tensile tests as well.