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The use of scanning vibrating electrode technique to evaluate the effect of hot stamping on corrosion resistance of press hardened steel 22MnB5 metallic coated with electroplated ZnNi

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The carmakers and all their production chain must achieve worldwide targets of lightweight, safety and reduced fuel consumption. The use of ultra high strength steel, such as press-hardened steels (PHS), in vehicle structures has been contributing with this. This type of steel is widely used in hot stamping process, which consists in heating the steel blank to the total austenitization temperature, and then transferring it from the furnace into the die where the steel is deformed and quenched at the same time, with a minimum cooling rate of 27 K/s. The boron-manganese PHS steel comprises perlite and ferrite microstructure, and its tensile strength is around 600 MPa in the annealed condition. Thus, after the hot stamping process the PHS microstructure completely changes to martensite and the tensile strength increases to 1500 MPa or more. The transferring step is a critical one, due to the contact of the hot steel blank with the atmospheric air; as consequence, it causes the steel oxidation. To avoid that, the steel is protected with metallic coatings. The hot-dip AlSi is the most currently used coating for this application, however, in order to keep up with the high PHS demand, alternative coatings, like zinc-base is under investigation. This work had the objective of evaluating the corrosion resistance of PHS, 22MnB5 grade, coated with electroplated ZnNi before and after hot stamping, using scanning vibrating electrode technique (SVET). The corrosion-localized techniques are more suitable, once the results showed that after hot stamping the coating layer changes completely, as a result of chemical elements diffusion. Thus, different phases of Zn-Fe-Ni are formed and random distributed which impacts the corrosion resistance of the steel.