Adhesion of zinc coatings affected by chemical composition of steel

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The relation of zinc coating´s morphology and adhesion was studied in respect to chemical composition of steel substrate. Coating thickness is an important requirement in the specification and effectiveness of hot-dip galvanizing as a corrosion protection system. The effect of silicon (Si) and phosphorus (P) in steel composition is known but the effect of aluminium-killed steel on quality of formed zinc and mainly its adhesion is not studied in details. Aluminium-killed steels suitable for galvanizing must have a low silicon content, below 0,03 wt. % according to published guideline. This study shows that the value can be slightly higher but not 0,07 wt. %. Excessively thick coatings generate high stresses at the interface of the steel and galvanized coating which causes the zinc to become flaky and separate from the steel surface. Other reason is that there is missing η phase in morphology of these coatings and only hard and brittle phases create the coating. The outer layer of pure zinc (η phase) is relatively soft and absorbs much of the stress of an impact damage. By minimizing the thickness of the brittle zinc-iron alloy layers, the ductility of the coating is improved. This paper gives some adhesion tests´ results of zinc coating on steels with different chemical composition.