Bonding mechanisms in spot welded three layer combinations

The strength of a spot weld generally stems from fusion bonding of the metal layers, but other solid state bonding mechanisms also contribute to the overall strength. Metallographic analyses are presented to identify the phases formed near and across the weld interfaces and to identify the occurring bonding mechanisms. When welding a combination of three galvanized steel layers where one outer layer is a thin low-carbon steel it is a common challenge to obtain nugget penetration into the thin low-carbon steel. It therefore happens in real production that no nugget is formed across this interface. It has been shown previously that such a joint can reach relatively high strength resulting in plug failure in tensile shear testing. Additional strength due to these bonding mechanisms is also obtained in common spot welds in the so-called corona band around the weld nugget.