The effect of double shot peening and nitriding on the die soldering behaviour of h13 and cr-mo-v tool steel

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Abstrak

In this study, H13 tool steel and Cr-Mo-V steel were treated by two different types of surface treatments, i.e. double shot peening with nitriding and single shot peening. Samples were dipped into the molten aluminum alloy ADC12 as a simulation of the die casting process and held there for 0.5, 5, and 30 minutes. Several characteristics were analyzed, including surface hardness, microstructure observation, and identification of elements on the intermetallic layer formed. The results of the research showed that H13 steel treated by double shot peening with nitriding had higher surface hardness (1402 VHN) than when treated by shot peening only (536 VHN). A similar tendency emerged with the Cr-Mo-V steel, which had 1402 VHN and 503 VHN after treatment with double shot peening with nitriding and the single shot peening process. In addition, with a dipping time of 30 minutes, the H13 steel treated by double shot peening with nitriding produced a lower average thickness of the compact intermetallic layer. Moreover, double shot peening did not form a broken intermetallic layer, while single shot peening formed one (91.66 μm). Likewise, the Cr-Mo-V steel treated by double shot peening with nitriding produced a thinner compact intermetallic layer than single shot peening, 22.2 μm vs. 27.77 μm, as well as a lower average thickness of the broken intermetallic layer, 40.2 μm vs. 113 μm. This indicates that material treated by double shot peening with nitriding could minimize the occurrence of die soldering.