

THE EFFECT OF PROCESS PARAMETERS ON THE LIFETIME OF COPPER ELECTRODES USED IN SPOT WELDING OF INTERSTITIAL FREE STEEL SHEETS

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ABSTRACT

The purpose of this work is to evaluate the electrode wear behaviour and the distribution of hardness in a joint made by the resistance spot welding process. The lifetime of electrodes was evaluated by examination of the electrode caps after more than 2000 tests with acceptable welds. A microstructural evaluation by optical microscopy (OM) and scanning electron microscopy (SEM) was carried out. The microstructure of the welded joint is primarily composed of ferrite grains. The microhardness testing results indicated a significant increase in hardness in the weld nugget, caused by the formation of martensite in the fusion zone. The hardness results showed lower values in all regions at the end of the useful lifetime of the electrode. The methodology used for selection of welding parameters has highlighted an optimal combination of 200 kgf electrode force and 9-cycle (cy) welding time, to increase the lifetime of the electrode and to achieve more weld points. Still, the cover electrode tends to form brass (Zn + Cu) on the indentation obtained by spot welding, subsequently reducing the electrode life. The results indicate the importance of combining and optimizing the welding parameters in order to reduce the wear of the electrode used for resistance spot welding.

KEYWORDS: electrode lifetime, microhardness, spot welding, nugget, Scanning Electron Microscopy (SEM).

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