INTERNATIONAL JOURNAL OF INTERDISCIPLINARITY IN THEORY AND PRACTICE
ITPB - NR.: 7, YEAR: 2015 – (ISSN 2344 - 2409)

ELECTRICAL RESISTANCE BRAZING OF COPPER ALLOYS AND LOW-CARBON STEELS

V. Lazić [1] - D. Arsić [2] - M. Djordjević [3] - R. R. Nikolić [4] - B. Hadzima [5]

Abstract: *The general problems related to electrical resistance brazing of various metals were considered in this paper. In brazing, unlike the electric resistance welding, different electrodes and technological parameters are used. For experimental purposes, electrodes were made of highly alloyed tungsten steel and of copper with graphite and tungsten inserts, so the symmetrical temperature field was obtained. That enabled heating localization within the contact zone of brass and steel thin sheets. Success of brazing was determined by testing the mechanical properties, micro hardness and microstructure of the brazed joint. Hardness measurement results suggested the strain hardening of the steel thin sheets, what imposed necessity of recrystallization annealing. It was necessary to apply both the flux and the silver solder for joining, since copper and iron are poorly mutually soluble. When the metallurgy problems were solved and the optimal brazing parameters selected, the optimal mechanical properties were achieved, which were experimentally confirmed.*

Keywords: Electrical resistance, ASM-Metals, soldering equipment

1 INTRODUCTION

Due to low solubility of copper-based alloys' and steel's basic components, i.e., copper and iron, brass and steel are difficult to join by the welding procedures. This problem can be solved by inserting the inter-layer made of the third metal, which is soluble both in copper and in iron. In this case, that is the silver solder in the form of a foil with addition of the flux in the form of the thin coating. To enable successful joining of those alloys, not only in the laboratory conditions, but also in technical practice, it was necessary to perform numerous tests, which made possible selection of the soldering parameters, which gave the needed mechanical properties of the brazing joint. Besides the mechanical properties, as the output characteristics of the joining, it was necessary to check the micro hardness and microstructure of the joint. Hardness measurements results pointed to strain hardening of the steel thin sheet, due to action of the compressive force during the brazing, what imposed the necessity for recrystallization annealing of the joint for the purpose of improving the structure, namely the mechanical properties and the corrosion resistance, Liptakova et al. (2014).

2 ELECTRIC RESISTANCE BRAZING FUNDAMENTALS

Electric resistance brazing is the process of joining metals where the Joule's effect – RI^2 is used as the heat source. There are three methods of electrical resistance brazing: *spot wise* (Fig. 1), used for joining steel and brass thin sheets, for joining parts in electronics, etc.; *seam wise*, used for making the box-like parts where the hermetic joints are required and *butt brazing*, used for brazing the sintered cutting platelets onto the steel holder of the cutting tools, Radomski and Ciszewski (1985), ASM-Metals Handbook (1979), JMM Brazing materials and applications (1967).

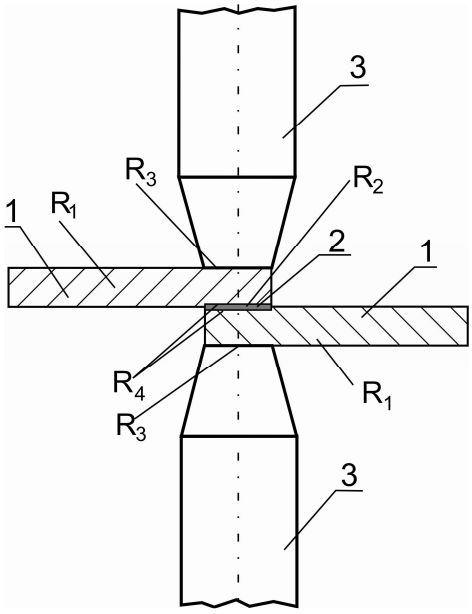

Figure 1 Schematic of the electric resistance spot brazing: 1 – brazed parts, 2 – solder, 3 – electrodes

Electric resistance spot brazing is relatively new technological procedure, which is characterized by the fast heating of the joint spot, easy regulation of temperature and the heating time, possibility of visual monitoring of the brazing process and simplicity of the procedure that can be performed by the lower qualified operators.