IMEC17
THE 17TH ISRAEL MATERIALS ENGINEERING CONFERENCE

STUDY OF DILUTION EFFECTS IN THE JOINT BRAZED WITH Cu-Ag ALLOY FOR STAINLESS STEEL COMPONENTS

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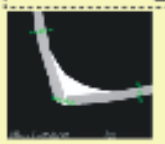
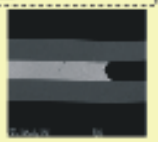
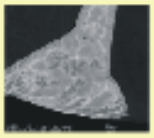
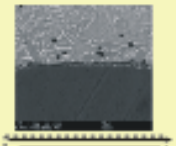
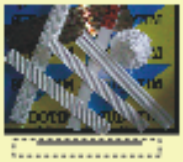
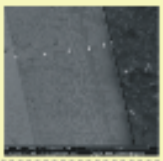
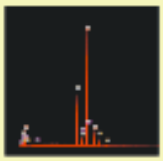
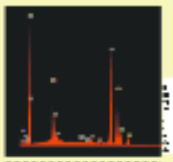
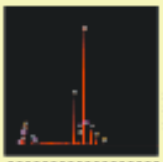
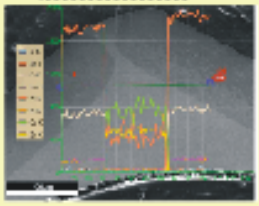
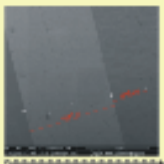
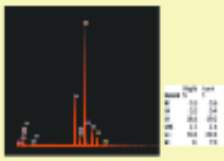
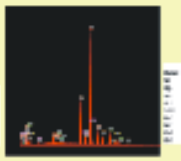
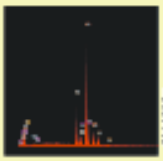





Background
The brazed joints made in stainless steel can be frequently exposed to water or vapor during service. This specific medium can promote interfacial corrosion failure of the joints. The special silver-copper brazing filler metal allows to avoiding the problems of interfacial corrosion and improves the strength of the joint. Most stainless steel types, with the exception of titanium or niobium stabilized grades, can be brazed. For brazing stainless steels in air with flux low-temperature silver brazing alloys are generally used.

Aim
In the research paper two different type of brazing filler material has been used for brazing stainless steel component and then the dilution phenomenon has been studied, in terms of chemical element displacement from the brazed separation interface.

Method
To be able to enter in the gap of the brazed joint, the brazing rod contains a double special covering that allows obtaining a difference between the melting temperature of coating and of the metallic rod. In this way, the filler metal can spread rapidly and fill completely the gap. Composite coatings contain 60 to 65% deoxidation flows, in accordance with EN 14045: 1999, 15 to 20% plasticizers and 10 to15% binder. They also contain nano-powders with suitable properties, such as wetting and deoxidation agents, to improve the diffusion and to increase the strength tear.

Results
Analyze of diffusion line was performed using electron microscopy SEM and EDX spectrometry. To evaluate the effects of dilution, some analysis of chemical composition was performed using scanning electron microscope FEI QUANTA INSPECT F provided with the electron gun with field emission - EGF with a resolution of 1.2 nm and X-ray spectrometer energy dispersive (EDS) with resolution of 133 eV at MnK.

CONCLUSIONS

1. Nickel and nickel base alloys are prone to cracking during brazing with silver brazing alloys. The cracking is known as intergranular penetration or stress cracking. It usually follows the grain boundaries and only occurs when components.
2. The analyzes performed to determine the extent of dilution in the case of two types of brazed joints showed the penetration of alloying elements from the solder (Ag, Cu, Zn) in the base material, over distances up to 20 microns.
3. Concentration of alloying elements in solder has ranged between 3% Ag, 10% Cu and 7% Zn at 10 microns distance from the interface to 2% Ag, 12% Cu and 7.5% Zn at 20 microns from the interface. The increasing of Sn addition can improve the wettability and mechanical properties of the joints. However, when the Sn content exceeds 5%, the shear strength of the joints decreases. Following this observation, the Sn content was kept lower than 2%Sn. The experimental alloy used in the study has a good spreading behavior and do not produce any cracking tendency.
4. The only types of imperfections observed in the brazed area were: un-melted flux inclusions and gas resulted from the coating of the filler material.
5. The filler materials used in this experimental study were produced through environmentally friendly technologies, without the use highly toxic materials (cadmium free) and based on an optimized technology, with differences between the melting temperature up to 50°C, between metal rod and coating layer.

Acknowledgements: The research work was financially supported by the Romanian National Program for Research in the framework of the Project No. **PCCA 188/2012 – High performance materials and techonologies for the realization of the knifes of mill for asphalt – MATFREZ.**