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Effect of the composition and production process parameters on the microstructure, residual stresses, mechanical and corrosion properties of gold alloys used in industrial processes

C Cason, L Pezzato, K Brunelli and M Dabalà
University of Padua, Italy

Gold alloys, used in the production of both hollow and solid gold chains, affect the optical and mechanical properties of various gold products because the corrosion resistance and the workability of the chains depend on these properties. It is important that gold alloys with high corrosion resistance do not degrade during the production process. The microstructure of the alloys strongly influences the mechanical properties, which have a key role in both the machinability and quality of the plates. In the present work, different compositions of gold alloys and various industrial deformation processes (annealing and rolling steps) were analyzed and optimized. In particular, the choice of the suited grain refiner is very important to avoid particular unwanted behaviors of the gold alloys. The changing of the production parameters and the compositions of the alloys leads to the formation of different levels of residual stresses within the material, which can generate a variation in the behavior of gold sheets. The microstructures were analyzed by OM and SEM observation, whereas the variation of mechanical properties by micro-hardness test. The residual stresses were evaluated using XRD analysis and the corrosion resistance by potentiodynamic polarization tests. The results showed that a high homogeneity of the microstructure and a suitable recrystallization process, with an increase of the quality of semi-finished products was obtained. Moreover, to improve the weldability of the final chains, a different gold welding alloy with a lower melting point was developed and optimized.

Biography

C Cason is at the second year of his PhD, and he works in the laboratory of the Department of Industrial Engineering of the University of Padua. The PhD project involves the study of the gold alloys and the optimization of the industrial production processes used to make gold chains. All the study was done in collaboration with the goldsmith company Filk S.p.A. He has published 1 paper in reputed journal.

claudio.cason.1@studenti.unipd.it

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