Low temperature surface hardening of stainless steel; the role of plastic deformation

Thermochemical surface engineering by nitriding of austenitic stainless steel transforms the surface zone into expanded austenite, which improves the wear resistance of the stainless steel while preserving the stainless behavior. As a consequence of the thermochemical surface engineering, huge residual stresses are introduced in the developing case, arising from the volume expansion that accompanies the dissolution of high interstitial contents in expanded austenite. This work addresses two aspects of the role of plastic deformation on the case developing during low temperature nitriding: - plastic deformation of metastable austenitic stainless steels leads to the development of strain-induced martensite, which compromises the uniformity and the homogeneity of the expanded austenite zone. - during low temperature surface engineering composition and stress profiles develop. On numerical modelling the evolution of composition and stress profiles from the processing parameters temperature, time and gas composition it is necessary to include elastic-plastic accommodation of the composition-induced strains associated with lattice expansion.

General information
Publication status: Published
Organisations: Department of Mechanical Engineering, Materials and Surface Engineering, Manufacturing Engineering
Contributors: Bottoli, F., Jespersen, F. N., Hattel, J. H., Winther, G., Christiansen, T. L., Somers, M. A. J.
Pages: 51-54
Publication date: 2016

Host publication information
Title of host publication: Proceedings from the 23rd IFHTSE Congress
Publisher: ASM International
Source: FindIt
Source ID: 2342435220
Research output: Chapter in Book/Report/Conference proceeding › Article in proceedings – Annual report year: 2016 › Research › peer-review