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Abstract

The present article is dedicated to the microstructural characterization of the surface layer of two different austenitic stainless steels, 304L and 904L, subjected to a low-temperature carburizing process (Kolsterising®, Bodycote) and a subsequent annealing at high-temperature. The carburizing treatment forms a hard expanded austenite in both materials. However, thermal decomposition occurs at high temperatures through precipitation of chromium-carbides, hence compromising the surface hardness of the treated materials. The purpose of this paper is to explore the potential applicability of electron backscatter diffraction (EBSD) technique to reveal the correlation between phase transformation and hardness. First of all, EBSD was used to create Kernel average misorientation (KAM) maps of the modified surface layers to identify the internal strains. Moreover, the preferential sites for precipitation of chromium-compound during annealing were identified. We prove here that EBSD can provide useful information to distinguish the main hardening mechanisms within modified surface layers at different annealing conditions. When combined with nano-indentation, X-ray diffraction (XRD) and glow discharge optical emission spectrometry