

Potential of Cow Horn for Carbonitriding Treatment of Steel

Waste and Biomass Valorization

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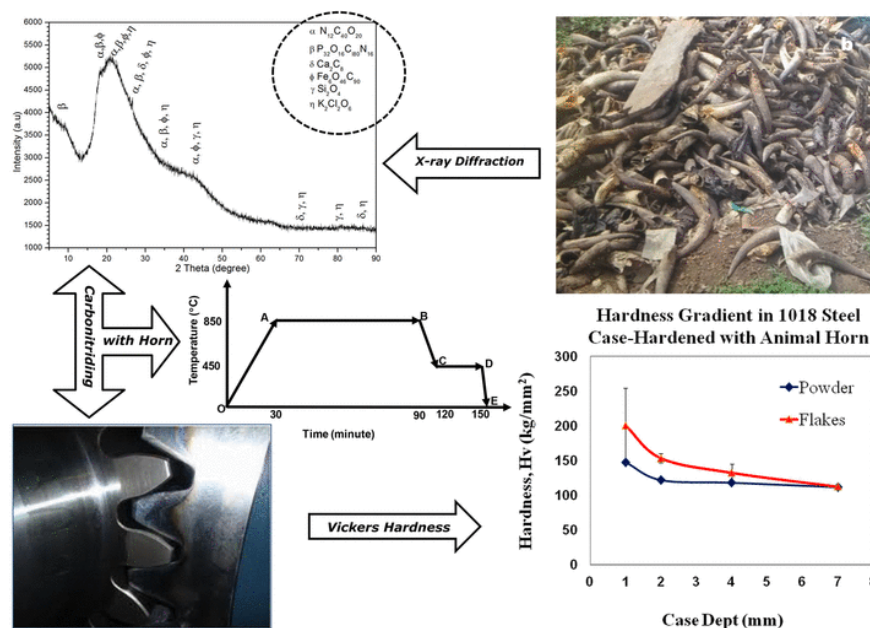
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Abstract

The potential of carbonitriding treatment of steel with cow horn was investigated in line with abattoir waste to wealth approach of waste management. The objectives of the study included processing of cow horn into different morphologies namely: powder and flakes for carbonitriding heat treatment, and, chemical analyses of cow horn with Energy Dispersive Spectroscopy (EDS) and X-ray Diffraction (XRD) techniques to determine the chemical composition and phases of cow horn respectively. The heat treatment was carried out at 850 and 450 °C for carburizing and nitriding dominated processes respectively. Vickers hardness measurement was carried out to determine the hardness profile on carbonitrided samples. Optical metallography was carried out for microstructural examination and to investigate phase contrast between the case and core of carbonitrided sample. The result of hardness test observed is consistent with the case hardening profile with higher hardness value at near surface decreasing towards core. Sample heat treated with horn flakes showed higher hardness than those with horn powder. Microstructural phase contrast showed delineation of the hardened case and soft inner core. The high hardness of case was attributed to diffusion of carbon and nitrogen atoms from the cow horn to iron interstices. This supposition was corroborated by detection of carbon and nitrogen with EDS and XRD tests. It was therefore concluded that cow horn could be processed as candidate materials for carbonitriding of steel.

Graphical Abstract



Keywords

Abattoir Carbonitriding Hardness Horn Steel Waste
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Notes

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