ABSTRACT

Leather processing employs a series of heavy chemicals that are detrimental to human health and environment at different stages of tanning. Determination of the elemental concentrations becomes complex especially using the conventional techniques since they involve tracking individual elements at different stages of leather-making processes. The study investigated the effect of crusting operations on the elemental concentrations using energy dispersive X-ray fluorescence (EDXRF) and principal component analysis (PCA). The spectral measurements of the post-tanned samples were carried out in vacuum using EDXRF-Rigaku NEX CG. The concentrations of elements were determined by advanced FP (fundamental Parameter) software-RPF-SQX (Rigaku Profile Fitting-Spectra Quant X) software. The abundance of the elements in the leather crusts was in the order
Cr > S > Na > Cl > Al > Si > Ca > V > K > P > Zr > Zn > Fe > Mn > As > Ti > Cu > Pb > Ni > Ga > Br > Hg. The concentration levels for the majority of the elements in the crusts were higher than the recommended safe extractible levels for leather. Combination of EDXRF and principal component analysis in this study has shown potential in the leather industry to monitor the chemical concentrations. A combination of Cu and RX9 secondary targets exhibited sufficient and excellent excitation efficiency for detection of the majority of elements in leather crusts. The valuable tracers for classification in the crusting operations are Cr, S, Cl, P, V, K, Mn and Zn. Retanning process increases S and Cu whereas levels of Cl decrease in the crusts. Dyeing and Fatliquoring processes raise the concentration levels of S while decreasing the Cl level.

KEYWORDS:

- **Crusting operations**
- **EDXRFs**
- **leather crusts**
- **elemental concentrations**
- **principal component analysis**