

Investigation of Clay Minerals – Vegetable Tanning as An Alternative Method to Chrome Tanning

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Abstract

Leather tanning involves the stabilization of the skin's collagen using organic or inorganic chemicals. Chromium III sulphate is an inorganic tanning agent that has gained popularity in the tanning industry due to its ability to impact the leather with superior properties such as high tensile strength and excellent thermal stability. However, chrome tanning has proved to cause environmental pollution at an alarming rate threatening the world's population health and marine life when the waste is openly dumped in rivers and land or incinerated. For decades now, ways to deal with chrome waste generation have been explored intensively which include: chrome tanning exhaustion, recycling of the tanning float, and use of alternative methods of tanning such as aluminum, and vegetable tanning. In this study, a combined tannage of clay minerals –vegetable tanning (mimosa) on a goatskin was investigated as an eco-friendly method of tanning. Clay samples were collected from Murang'a County and characterized using the XRF and XRD to determine the physical characteristics and chemical composition. The finding indicated that the two clays were kaolinite and halloysite and the chemical composition had SiO_2 and Al_2O_3 as the major compounds present in the two clay minerals. The clay samples were then modified using

concentrated formic acid and used to tan goat skin. The physical properties of leathers obtained were analyzed using IUP methods. The results obtained for both leathers tanned using modified kaolinite and halloysite had attained the minimum recommended values for all the tests done. Moreover, leather tanned using halloysite had better physical properties compared to that tanned using kaolinite and as a result, modified halloysite clay was used for further processing of the leather. The leathers tanned using 3%:5% and 3%:10% (clay and mimosa) had properties comparable to those of chrome tanning and allowed a reduction of the amount of mimosa used during retanning which has a positive impact on the economic aspect as well as the environmental. From the findings of this study, combined tanning of clay minerals and mimosa vegetable tanning is a possible alternative to chrome tanning as it is an eco-friendly method of tanning.

Keywords: Halloysite, Kaolinite, X-ray diffractometer (XRD), X-ray fluorescence (XRF).