

# PREPARATION OF PH-SENSITIVE MEDICAL DRESSING WITH CURCUMIN AND BROMOTHYMOL BLUE: CHARACTERIZATION AND BIOCOMPATIBILITY EVALUATION

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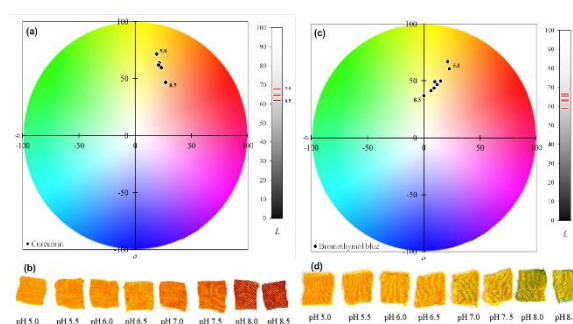
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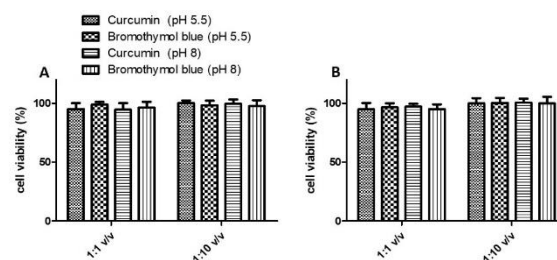
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**Abstract:** The pH of the stratum corneum is considered a fundamental parameter for human skin normal functions. Many clinical and experimental studies have investigated the task of pH of the stratum corneum and its importance for the barrier function of skin [1]. pH monitoring is particularly crucial in the wound healing process, higher pH values were detected for acute and chronic wounds [2]. The use of non-invasive and biocompatible pH monitoring methods is preferable to other technologies. Halochromic dyes are part of the wide family of chromic dyes that are able to change color in response to certain external stimuli, like pH variations of the surrounding environment. Flexible pH sensors could be obtained by incorporating these dyes into textile materials. Literature reports the development of some textile pH sensors prepared by means of halochromic dyes [3]. However, to date, the works lack the evaluation of the biocompatibility of the textile sensors. In our work cotton/polyamide 6 medical dressings were successfully dyed with the pH-sensitive dyes, Curcumin and Bromothymol blue. The work addressed two different topics: on the one hand, the dyeing process of the medical devices, and on the other hand, the evaluation of the biocompatibility of the dyed textiles. The biocompatibility of the prepared medical devices with human skin was evaluated by means of MTT assay on in vitro cultures of human epithelial cells (HaCaT keratinocytes). The dye potential accumulation in the skin layers was assessed through in vitro permeation studies with Franz cells. The textiles were dyed according to an acid dyeing exhaust procedure. Both Bromothymol blue and Curcumin dyed samples evidenced a high pH sensitivity in the range from pH 5.5 to 8.5. The dyed samples evidenced a good fastness to washing and perspiration. Almost no dye leaching was observed from the dyed samples, and no influence of the pH sweat was noticeable. The cytotoxicity of the two dyes release was evaluated on human keratinocytes. The eluate samples did not show any cytotoxic effect on HaCat cell lines. The cells incubated with different concentrations of the eluate samples showed percentages of viability comparable to that of untreated cells, indicating that both the dyed textiles are not toxic and cytocompatible. The in vitro permeation studies showed the absence of Curcumin or Bromothymol blue in the receiving phases at all the times of withdrawn. The results obtained evidence that the medical dressings prepared have the potential to be used in contact with the skin to monitor skin disease in order to prevent further infection.

**Keywords:** halochromic dressings, dye fastness, cytotoxicity, skin permeation.



**Figure 1** Halochromic properties of the dyed samples



**Figure 2** Cytotoxic effect of Curcumin and Bromothymol blue dyed textiles on HaCaT cells after 24 and 48 (panel A, B respectively).

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- [1] Fluhr J. W., Elias P. M. Stratum corneum pH: formation and function of the 'acid mantle'. *Exog Dermatol*, 2002; 1: 163-175.
- [2] Schneider L.A., Korber A, Grabbe S, Dissemmond J. Influence of pH on wound-healing: a new perspective for wound-therapy? *Arch Dermatol Res*, 2007; 298: 413– 420.
- [3] Arafa A. A. et al. Preparation and characterization of smart therapeutic pH-sensitive wound dressing from red cabbage extract and chitosan hydrogel. *Int J Biological Macromolecules*, 2021 182, 1.