



# MINERALOGY OF SOUTHERN AFRICA MEDICINAL AND COSMETIC CLAYS AND THEIR EFFECTS ON THE GROWTH OF SELECTED TEST MICROORGANISMS

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## ABSTRACT

Clay samples used by people of Southern Africa for cosmetic and medicinal purposes were mineralogically characterised to determine their mineral constituents, and their effect on test microorganisms determined to elucidate their potential antimicrobial activities. Munsell Colour tests, X-ray diffractometry and scanning electron microscopy techniques were used in mineralogically characterising the samples. Standard microbiological techniques were employed to determine the sensitivities of *Staphylococcus aureus*, *Bacillus subtilis*, *Micrococcus luteus*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Candida albicans* to extracts of clay samples. Mineralogy results of the clay samples depicted three main colours with their related shades being yellow dominated by goethite, red consisting of haematite, and white composed mainly of kaolinite, but illite and montmorillonite being also present. Most of the clays were not of a homogeneous single phase component but often contained two or three clear different groups of minerals. Morphologically, the Fe-rich minerals appeared to be in two groups: the needle-like structures and fractured flakes with large areas of clear compacted platelets. The aluminosilicate clays had colours ranging from yellowish to white. Some were Si-rich and consisted mainly of quartz. Some of the clay samples clearly demonstrated antimicrobial activities. The clays were grouped into six broad groups according to their antimicrobial activity and based on their colours (brown, red, yellow, white, pink, and dark green/grey). The red and brown clays were moderately (++)-to-highly (+++) active against Gram+ and Gram-bacteria, but showed no anti-*Candida* activity. The yellow clays showed no antimicrobial activity while the white, pink and gray-green samples were highly active against both Gram-positive and negative bacteria, and against *Candida* sp. This calls for further investigation on the microbiology of these clays used for cosmetic and medicinal purposes. If health benefits are to be linked to such clays, they must be further explored to understand the science supporting the continued use and usefulness of these traditional cures for different cultures in the Southern African region.

**KEYWORDS:** antibacterial, antifungal, antimicrobial agents, environmental health perspectives, goethite, haematite, kaolinite.