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# Bentonite Clay: Nature's Ancient Remedy for Modern Health-Interlinking Soil Science Domain towards Human Lifestyle

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Soil was known to consider as dirt and dust by everyone. But actually, its inner principle and reliability was not seen or consider as science. Every action in mankind has its own science and the world is functioning beyond it. Clay was consider to be part of soil textural classes and it was being developed under influence of various factors and soil forming processes. The clay under smectite group of minerals was consider as important because of its expanding type which put-forth better water absorption, nutrient retention, soil buffering capacity, better crop performance, remediation of heavy metals in soil, different complexation etc. Rather for agriculture point of view, the clay mineral encompasses significant and prominent role. In other hand, many articles haven't reported the key use of Bentonite clay towards traditional habits, and remedies in many cultures. This article underscores the outline of Bentonite clay and its potent use in Indian culture for various purposes.

## Introduction

Geographical structure and principle were consider as a resurgent behaviour on human and animal way of living (Young *et al*., 2011). The presumption of consideration that earth itself having a healing habits towards human body. The Bentonite clay was actually aluminium phyllosilicate clay under smectite group of clay minerals (Afriyie-Gyawu *et al*., 2005). This clay was named after Fort Benton at Wyoming where the abundance of this minerals were very high. Also, the name of Montmorillonite clay mineral, derived from place of Paris (France) called Montmorillon, where it was first identified. From our ancestors to till now in every part of country and different continents, the utilization of clays was believed to cure for its therapeutic benefits. When such clay were mixed along with water and make it as fine paste, which is being used both externally and internally.

**Fig. 1. Bentonite clay face mask**

In some part of countries like Iran and Iraq, they were widely using Bentonite clay for hair cleanser since from ancient period. Thus the clay was considers as abundant in natural, non-expensive and natural oriented, this article highlights the importance of Bentonite clay and how it was related to human lifestyle.

## Bentonite clay

Bentonite clay is a natural oriented clay mineral which is formed from volcanic ashes after reaching over time, it's started weathering and finally formed to clay particles. It was well known for its absorbent and swelling properties when it was mixed with water. In Indian agriculture context, it was crucial for agriculture productivity because of its swelling and shrinkage capacity. The layer structure of clay was represented in Fig.2.

**Layer Structure of Bentonite**

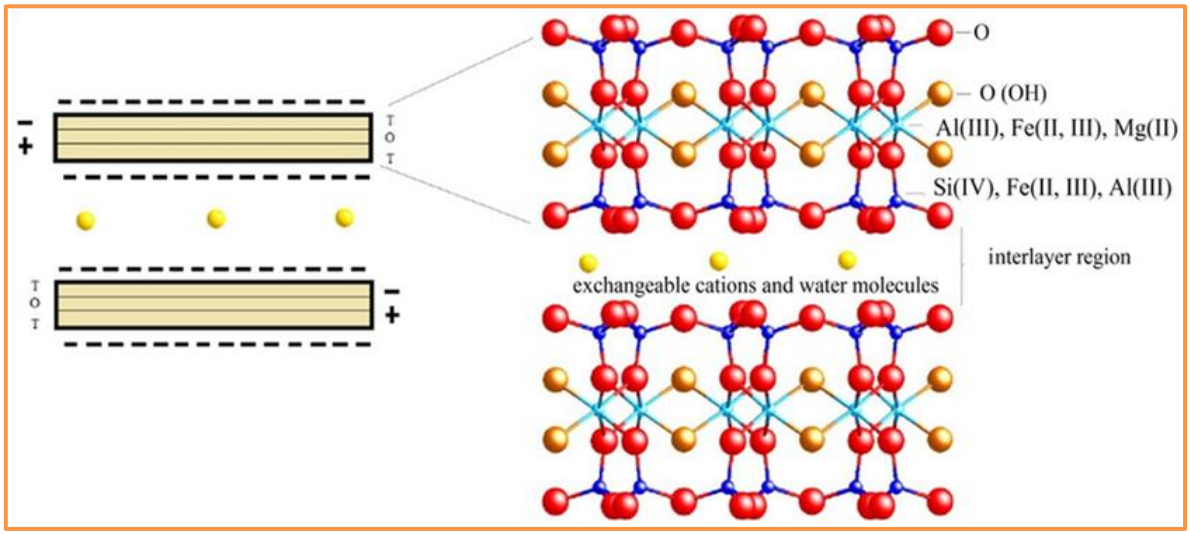


**Fig. 2. Diagrammatic sketch of the layer-structure of Bentonite clay**

## Benefits of Bentonite clay in relation to facial cosmetics

**1. Absorption of oil layer from skin**

Skin usually diploid of having sweat, oil, etc. due to presence of secretion of glands in human body. At such condition utilizing bentonite clay aids for remedies. It is highly absorbent in nature, utilizing its effective for oily and acne-prone skin. Also, it reduces excess presence of sebum, dirt, and other impurities which tend to clog pores in the skin.

**2. Evacuate clogged pores in outer skin surface**

Through nature of better absorption of clay, it unlocks the pores and eventually reduces the possibility of appearance including blackheads and whiteheads

**3. Smoothening of skin irritations**

The anti-inflammatory nature of the clay helps calm and relieve skin irritation, making it beneficial for conditions such as eczema and diaper rash.

**4. Improvisation of skin tone colour and complexion**

Using bentonite clay regularly can enhance skin tone and complexion by clearing away dead skin cells and impurities, unveiling a brighter and healthier appearance.

**5. Better collagen production**

Research indicates that applying bentonite clay to the skin may promote collagen production, a key factor in maintaining skin elasticity and firmness.

**6. Reduced development of pores in skin**

Due to its absorbent nature, bentonite clay can help tighten pores, making them appear smaller.

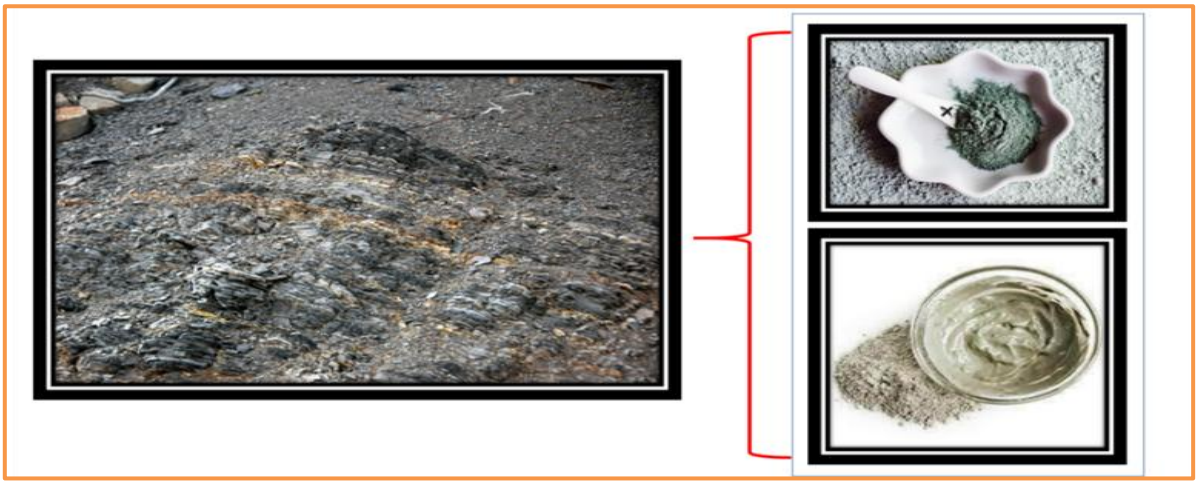

**Fig. 3. Preparation of Bentonite soft cream for facial application through clay**

**Treatment for cancer**

Under medical research field, clay mineral especially Nano-clays were employed as an efficient and effective drug delivery system for many G1, G2 drugs in relation to oncological therapy which includes Paclitaxel, 5-fluorouracil, 6-mercaptopurine because of its characterisation of high zeta-potential.

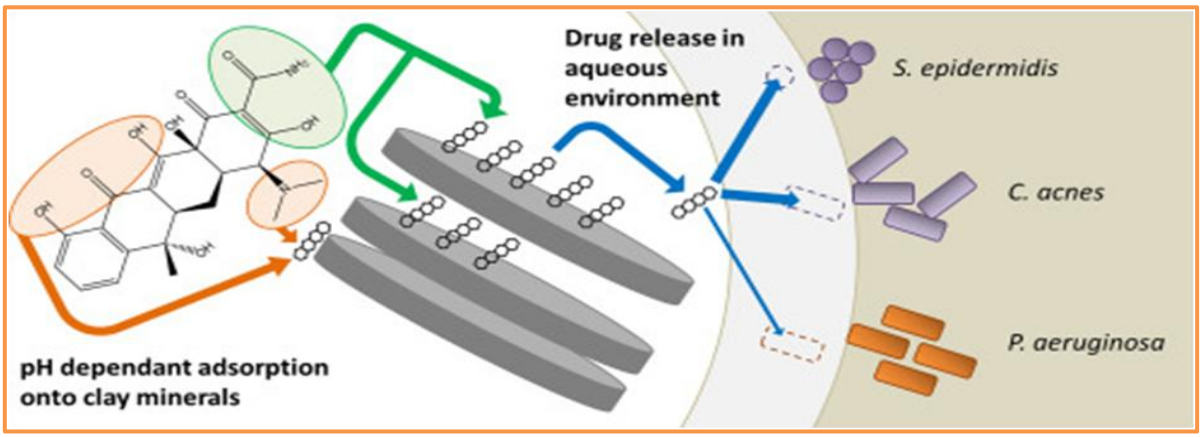


**Fig. 4. Schematic representation of the interaction of MMT (A)/modified MMT with amino propyl silane (B) and HNT (C) with a drug** (Shafei *et al*., 2021)

**Anti-bacterial effect**

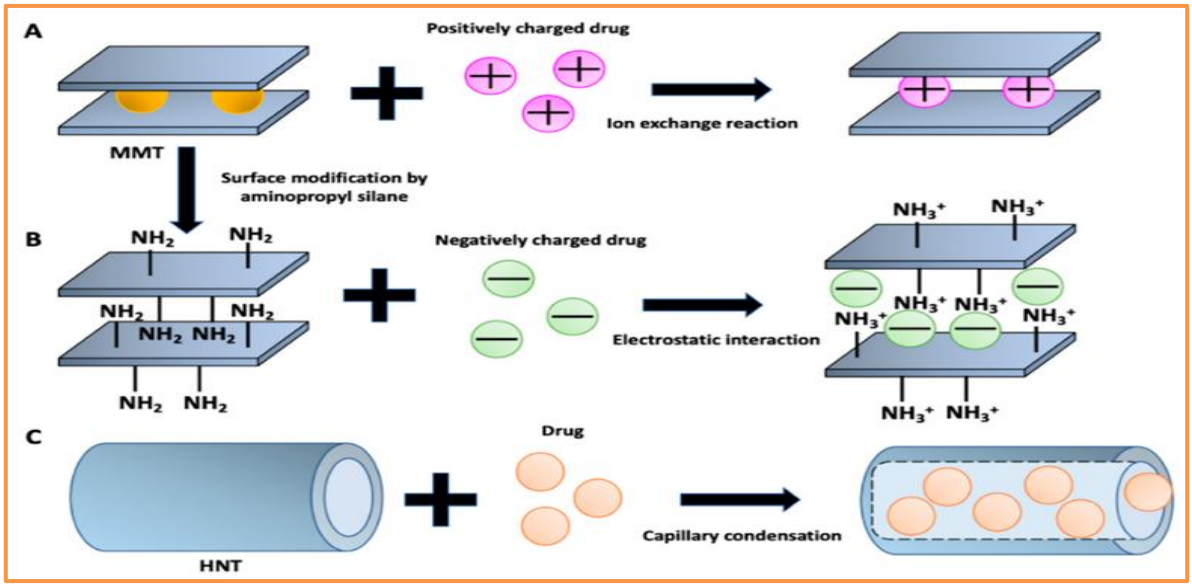


**Fig. 5. Formulation and antibacterial properties of clay mineral-tetracycline and -doxycycline composites** (Hamilton *et al*., 2019)

It was known to occur that many natural deposits of minerals were prone for anti-bacterial properties which led to discovery of novel compounds. The ill-effect of coliphages bacteria was absorbed by montmorillonite clay (T1 and T7) of *E. coli* under in-vitro condition (Schiffenbauer and Stotzky, 1982). When the clay was mixed with water (2–4 parts water to 1 part clay) and incubated for 24 hours with live bacteria at body temperature (37°C), a broad spectrum of bacteria was killed.

**Kidney-renal function**

Natural clay has its own behavioural structural pattern, where it is eliminated by the kidneys, creatinine, a breakdown product of creatine phosphate in muscle, is a significant predictor of renal health. It is possible for creatinine to diffuse from the blood artery to the intestine and then be reabsorbed there. According to reports, montmorillonite lowers serum creatinine in a mouse model of hyper-creatininemia by absorbing it in the GI tract and hastening its elimination from the colon in human body.

**Precautionary measures**

Although every scientific principle has its own merits and demerits. Undergoing complete understanding its actual scientific principle and mechanism will reflect better way for understanding its usage. Though bentonite was consider for its different positive usage and benefits, also it has some unwanted effect. For example, an incident was happened that ingestion of bentonite for cattle causes hypokalemia and hypochromic anemia. Thus it was advised to follow proper protocols before undergoing any scientific preparation or formulation preparation for human or cattle usage.

## Other usage of clay mineral

**Clay Minerals and Biopolymers in Film Design**

Research findings on bio-polymers were keen increasing to replace high molecular hydro-carbon compounds like petroleum based plastics. Clays such as bentonite, laponite, and kaolin, as well as clay minerals like montmorillonite, kaolinite, halloysite, sepiolite, and palygorskite, are commonly utilized as reinforcing agents in polymer nano composite materials. Clay minerals can interact with biopolymers through different mechanisms (like intercalation, exfoliation, or interactions on the external surface), resulting in materials with significantly altered properties. These materials, known as bio nano-composites, generally exhibit unique consistency and thermal, structural, mechanical, and optical properties. The potential use of biopolymers such as starch, gum, alginate, chitosan, gelatin, pectin, protein, and others as alternatives to conventional food packaging materials that use synthetic polymers has garnered significant interest due to the increasing popularity of sustainability and environmental protection

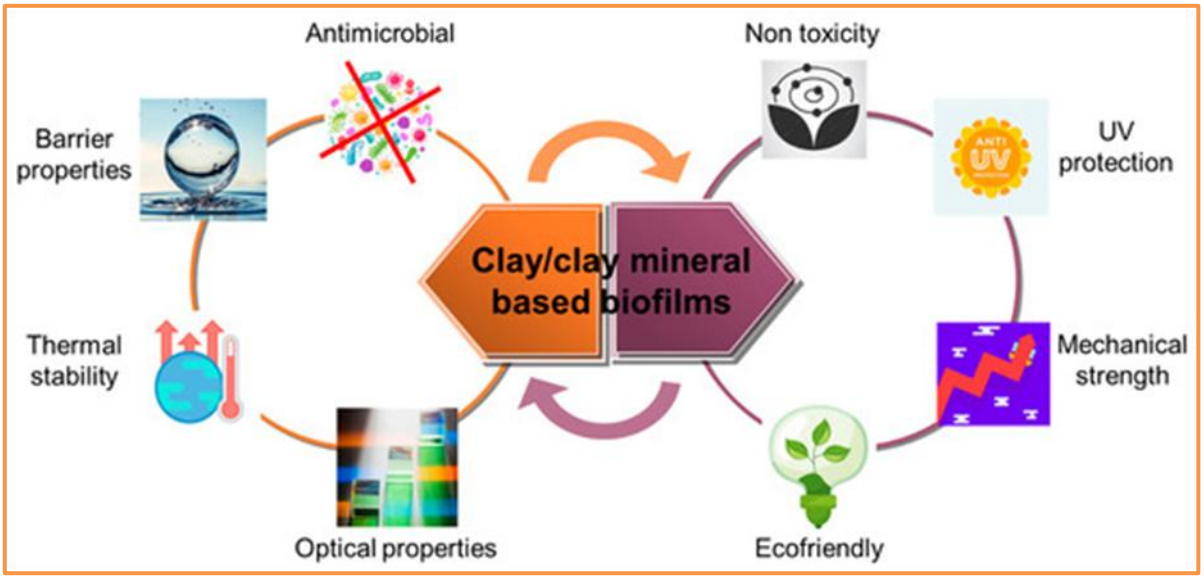


**Fig. 6. Properties of films obtained by combining clays and clay minerals with biopolymers** (Trigueiro *et al.*, 2024)

## Conclusion

This article strongly highlights the effect and impact of using bentonite clay minerals towards human life style. More than 25 product compound and conditioners had been developed and still ruling in the market. Prime research governing clay minerals should stretch beyond agriculture and focus on human living life-style pattern. Thus, it was strongly recommended that, every natural resources has its own scientific principle and usage. We should develop it in such way that it should brings economic feasibility and better human usage over it and future findings can overview nano-based clay compound for different sectorial benefits, reliability and sustainability.

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