



Cosmetic Chemistry: Applications of Natural, Synthetic and Semi Synthetic Polymers

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Abstract

Metic pharmacists are liable for guaranteeing the protection of product which will be applied on to the hair or skin of customers. Cosmetics made from artificial and/or synthetic polymers, whether or not concerning natural polymers or not, exhibit heat thermal structure, and chemo sensitivity are all factors to consider. For deterring, emulsifying, mixing, and moisturizing effects, cosmetic ingredients/adhesives are included. Within the long term, adverse chemical reactions have effects for the system and humans. Several cosmetics have medicative properties. Often, different individuals use cosmetics in numerous ways. The excellence between cosmetic and medical analysis is blurring as a results of this rise in beauty analysis; major cosmetic companies' laboratories are conducting comprehensive research in areas cherish matrix biology, antioxidants, and ageing processes. It terms of production, marketing, distribution, and pricing, applicable rules and laws ought to be established. During this review paper properties of synthetic, synthetic polymers, & cosmetic applications are mentioned in this study. Their use in each standard and innovative construction.

Key words : *cosmetics, co-polymers, emulsions and surfactants;*

1. Introduction :

During the twentieth century with industrialization the usage of beauty reached a brand new excessive as an increasing number of humans began out placed on make-up to decorate their visible appeal. [1] Cosmetic (care substance) are all approximately changing/ enhancing the arrival or Smell of the human frame. [1] Cosmetic are pores and skin care merchandise use to decorate a Person's look or smell. [2] Chemical compounds are the maximum common; a few are natural, however the majority are artificial [3,4]. The word "make-up" refers to a class of cosmetics that specializes in shades and improving the arrival of the

customer. [5] Cosmetics are merchandise which are carried out to the frame for beauty purposes, including to a person's feel of health and emotional development. [6,7] Since historical times, humans have used face portray and jewel encrusted headdresses to decorate their bodily beauty. This case module Cosmetics that assist to cleanse and decorate the pores and skin, hair, nails, and tooth may be the focus. Cosmetics are created via a chemical process that is probably easy or complex, and the completed product must be dealt with with care [8,9]. Considered To save you micro organism from entering, pores and skin lotions, lotions, and different pores and skin treatments, mainly lotions, are frequently synthetic in easy rooms. There is very little threat of pores and skin reactions with this cream. Employees who input the easy room are required to put on defensive garb and a face masks in any respect times, and the room's air first-class is monitored [10]. This might also additionally give an explanation for why Hu positive women's face lotions are so pricey. The term "skincare" refers back to the remedy of the complete frame.

Range of washing merchandise, inclusive of soap, perfumed soap, bathe gels and lotions. [11-13]

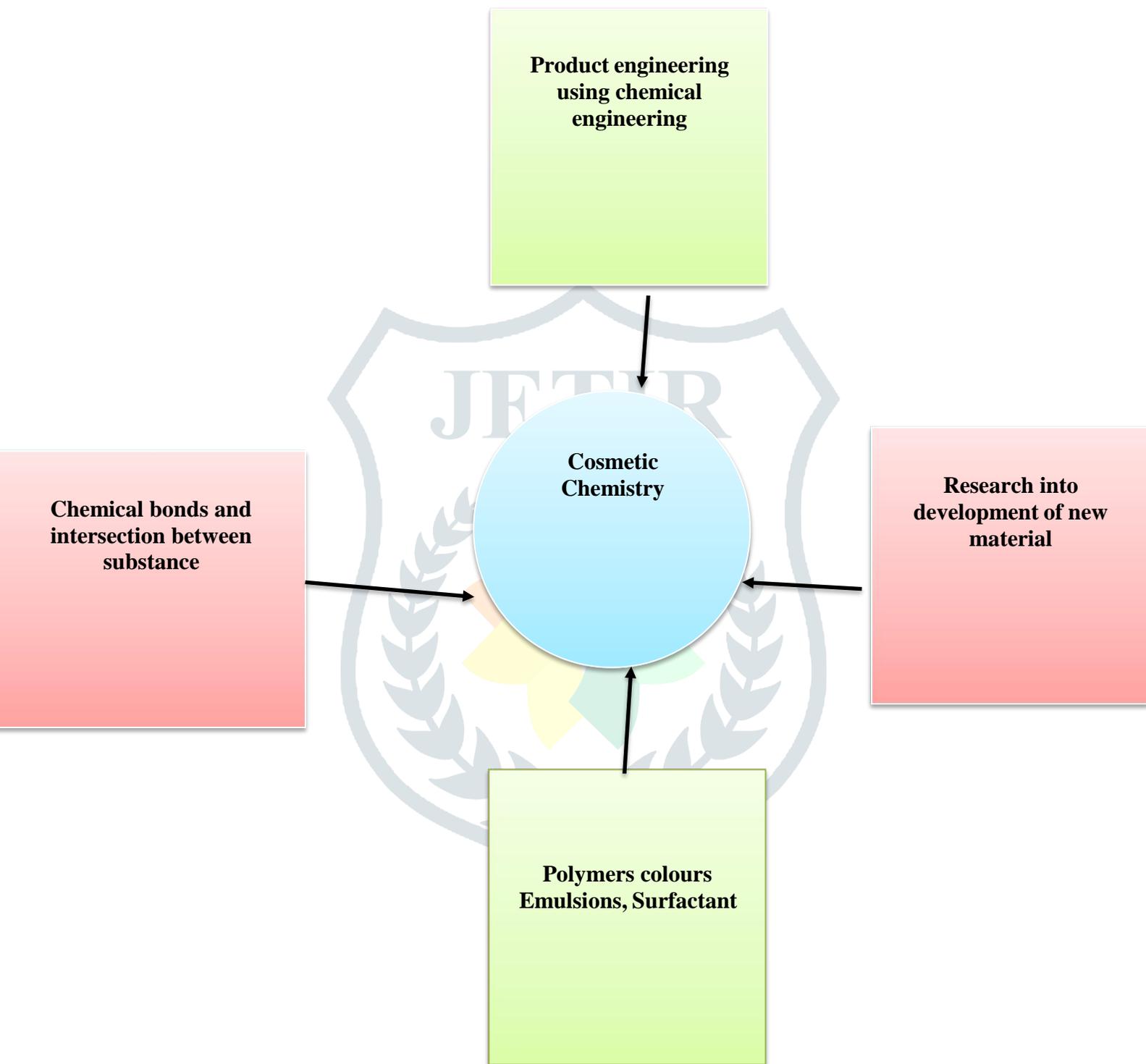
Coat paints, Mineral compounds often incorporate additives like Titanium dioxide & zinc oxide that are additionally sunburned. Mica, in addition to pigmenting minerals inclusive of tin oxide, magnesium misstate & iron oxide have a role. Colored minerals consist of tin oxide, & magnesium misstate, iron oxide [14]. An synthetic fragrances, antiseptics, parabens, mineral oil, and synthetic colorings are only a few examples. Are typically absent from the mineral textbooks [2,4]. Some mineral chemicals, however incorporate Bismuth oxychloride, can worsen touchy pores and skin [14,15]. Some incorporate talc, that is contraindicated due to its cosmogonic ability (ability for clogging pores and inflicting acne) and the truth that positive humans are touchy to it Cosmetics and private care industries flourished withinside the twentieth century.

Globally During the wet season (2016-2022), the cosmetics enterprise is anticipated to develop at a median of 4.three percentage on common every year, reaching \$ 429.eight billion through 2022 [16-17]. Cosmetics, in keeping with the European Commission (2015), is any meant substance or association related to outside human frame additives (lips, hair system, epidermis, tooth, nails extremal) & egg yolk. Polymers may be determined in shampoos, conditioners, tips, hair, dye, face cream, and gel preparation; pores and skin care items consisting of sunscreen, lotions , drinks shop & enterprise oils and hair product's consisting of shampoos, conditioners, tips, hair dye, face cream, and gel preparation, and care of nails, cosmetics, and perfumes [18]. Each of those merchandise has its personal set of features and features, further to the numerous traits in document formulation, manufacturing method, and bodily and chemical properties, which necessitate the usage of a numerous set of polymers. Polymers are a critical issue of artificial materials, as they're required for the introduction of excessive-performance materials. Makeup is described through the European Commission (2015) as any chemical or extrade that interacts with severa outside organs of the human frame's (lips, epidemic out of doors of the nails & hair system), mucosa & tooth [19-20]. Polymers may be utilized in a number of hair product's inclusive of shampoos, conditioners, tips, hair dyes, lubrication, gel preparation; pores and skin care merchandise, inclusive of liquid soaps, lotions, sunscreen, and corporation oils; and care of nails, cosmetics, and perfumes [21]. Each of those merchandise has exclusive features and features, in addition to the structure, manufacturing, and bodily and chemical parameters that require exclusive sorts of polymers. Polymers are an quintessential a part of artificial materials, that are important for the development of enormously green materials. [22]

2. Chemistry involved in cosmetics ?

Chemicals, both natural and synthetic, are added to the cosmetics to create an attractive scent. Even 'unclean' products may contain fragrances for other chemicals (Fig.1). There are more than 3,000 chemicals used to create a wide range of perfumes used in consumer products around the world. [23,24]

Figure (1) Cosmetic Chemistry



2.1 Emulsions :

Emulsions make up most of creams and lotions. When one substance is added as fine drops to another, the result is an emulsion. A typical oil-based emulsion (o / w) will be milk of the same type. The process of homogenization disperses milk (oil) in water as fine droplets [20, 21-25]. The presence of emulsifier, in this case of a milk protein is called Sodium casein ate and many phospholipids, allows the fat to float faster. Water disperses like droplets and is suspended in an oil process to supply water to oil (w / o). [25]. Continuous phase means a category of unused liquid or external suspension. Mayonnaise is an example of an aqueous oil emulsion, made from fine drops of vinegar still dispersed in a continuous phase of bean oil. The emulsion mayonnaise is fortified with lecithin from the eggs. [26, 27]

2.2 Surfactants:

Surfactant active agents are emulsifiers that act as surfactants or active agents. These substances have the ability to lower water tension. The HLB, or balance, of an emulsifier site determines how well it works [30]. The size of the hydrophilic part of the molecule (preferring water or polar) relative to the size of the lipoprotein (oil loving or nonpolar) determines HLB [28-29]

The HLB scheme is used to determine the dimensions of objects. The soluble in water is more than twenty points higher than the polar-free, oil-soluble, which is very close to nil. Because of its high water solubility, HLB of sodium casein ate is given in about fourteen doses [30,31]. HLB levels are found in lecithin, which is insoluble in water. All have high-powered teams. Sodium is the polar group of milk protein. The active ingredient in Lecithin is a molecule known as phosphatidylcholine, or PC. The active phosphate group is the polar, or soluble, part of a PC. A large number of polar emulsifiers are aimed at the water phase [32]. They are nonpolar and lipophilic class of compounds. These circular structures provide emulsion stability through the use of Hydrogen bonding and weak electrical energy [33].

2.3 Polymers applied in Cosmetics :

Polymers are widely utilized in personal care and cosmetics. The polymer class used is an example of a single class of building materials having a diversity of features. This step focuses on a polymer that can be used in a variety of applications. Table 1; lists the features of synthetic, semisynthetic, and natural polymer's used in cosmetic (33- 35).

Table - 1

SYNTHETIC	SEMI - SYNTHETIC	NATURAL
Polyethylene glycol	Cellulose – Derivatives	Polysaccharides
Acrylic acid – based	Cellulose acetates	Xanthan gum
Polyacrylamide	Cellulose nitrates	Alginic acid
Vinyl acetate	Chitosan	

2.4. Synthetic polymers :

Polymers are as popular as cosmetics because They can be used for a variety of purposes. Natural polymers are normally more expensive, but they can be manufactured wider and have a longer shelf life. Homo polymers and copolymers based on acrylic acid, polyacrylamides, silicon, and alkaline oxide are a synthetic polymer widely used in cosmetics [36- 37]

Polyethylene glycols (PEGs) and their anionic or non-ionic forms are commonly used in cosmetic's as emollients (which aid to soften , soften the skins), emulsifiers (which enable oil & water elements that work well together), and boosters. Compounds that help other substances go deeper into the skin's layers [38,39]. Includes goods for washing and shaving, skin care, make-up, and skin cleanser, shampoo, hair conditioners, and soaps. Pomace et al. (2020) used the kernel of *Magnifler indica* .To improve Nano emulsion loading, which resulted in a better product Continuity and saturation of promising anti-acne products [24]. This mixture is made up of Safflower oil, PEG-7 glyceryl coco ate, [40]. Cetareth-20, PEG-40 hydrogenated castor oil, sorbitan, olivate and butylated hydroxyl toluene are a few of the ingredients. Nano emulsion is a mixture of incredibly small droplets. This improves the physicochemical and antibacterial stability of M-extraction, as well as skin firmness. The *indica* plant's nucleus. (#27) Aliphatic polyesters such as poly (prolactin) (PCL), poly lactic acid {PLA}, poly (caprolactone) (PCL), have high biodegradability, biological compatibility, and manufacturing (3-hydroxybutyrate-co-3 hydroxy valerate) [41,42].

These materials have high mechanical qualities and are soluble during the manufacturing process, which natural polymers do not have (such as cellulose, chitin, and gelatin). Because of these qualities, aliphatic polyesters are becoming more popular as microbeads in stable cosmetics [43].

2.5 Semi – Synthetic :

The two major cellulose structural groups, cellulose ether and cellulose esters, have distinct mechanical properties, [44] . Physicochemical. The properties of cellulose include viscosity in solution, surface performance, thermoplastic film topologies & resistance to heat, hydrolysis , biodegradation & oxidation. Unlike cellulose acers (cellulose), ether cellulose (e.g. methylcellulose, ethyl cellulose, etc.) is a kind of cellulose. [45,47] sodium carboxymethylzoyl cellulose, and hydroxyethylxymethyl cellulose). Features of solid recording Gels and lotions are two types of cosmetics [48]. Infection is not a problem with natural gels including odium alginate, pectin , acacia, ager & gelatin [7] Among (2019) use dissolved micro needles composed of wood, natural polymers & synthetic to administer alphaarbutin transepidermally to light skin. Natural, or composite polymers . The patch was fixed with Gantrez TMS97, polyvinylpyrrolidone K-90, chitosan & hydroxypropyl methylcelluse . They discovered that an 8 percent polymer composite (8 percent w/w HPMC: 40 percent w/w PVP K-90 (1: 1) is more effective than alphaarbutin- loaded microneedles. The structure of alpha-arbutin is similar to that of a gel [49,50].

2.6 Natural Polymers :

Natural polymers are commonly utilized in cosmetics, as seen in the table. They're interactive, clean, friendly, and customer-friendly, and they're good for skin care, skin and hair care, conditioners, and stabilizers [51].. Among the ingredients are polysaccharides, gluten, xanthan gum, collagen, and hyaluronic acid. Collagen, and hyaluronic acid are among the polymers of nature are widely used [51-53]

Polysaccharides are a natural source of starch, which can be used in many ways, including soluble starch and granule starch [54,55].. When the soluble starch is removed, it is heated and dried to withstand moisture, As a result, your hair and skin will be silky smooth. Granule starch contains hydrogen of its own hydrogen bond that have been adjust to prevent them from breaking down, leading to hair and skin smoothness [56]. Due to the variability in amylose content, various starchy sources such as non-ionic polymers, such as potatoes, corn, pinion, and cassava roots, have slightly different properties in cosmetic composition. In the release of antioxidants and other activities embedded in the skin, a combination of starch and other natural polymers, such as chitosan, was used. Natural polymers can combine with cellulose in some cases. Cellulose can be combined with other natural polymers, such as carrageenan, to create cosmetics and thickeners .Carrageenan can be used as a stand-alone binder to improve texture adherence and viscosity [57-59]. Many applications in the cosmetics industry have used modified celluloses, especially as colloidal stabilizers and rheology modifier's Since transformed celluloses are larger molecule 's their advertising process is slower than that of smaller molecules containing more operating substances. Due to the combination of solubility, heavy replication, and the entropic supply of other biopolymers, although it has much higher material and structural properties than synthetic contracts [60]. Silk fibroin is a firming and lubricating agent that can be applied to creams and shampoos. It is also used in nail polish remover. High splendor and low circular markings indicate the silk of fibroin micro particles. The high crystallinity index ensures great physicochemical stability, which simplifies aesthetic processing [61]. Hard and light polypeptides are bound by a disulphide dyad link at the C-terminus, dividing silk fibroin into reconstructed hydrophobic and hydrophilic peptide sequences. Silk fibroin micro particles are made using an electrospinning method. An aqueous solution of aqueous silk fibroin at low temperatures, to be used continuously to incorporate heat-sensitive bio actives [62-63].

2.7 Overview of Polymers used in Cosmetics :

While polymers adhere to specific cosmetic features and benefits, their performance is dependent on other compounds in the formulation, such as solvent, surfactant, and electrolyte, as well as pH, are all factors to consider. Additive sequence during processing, and circumstances. Processing includes things like temperature and turbulence [64]. In order to prevent the onset of disorders linked to It's vital to examine the polymer compatibility of each raw material used to make the product if there's any cohesive instability, such as hardness or phase separation. [65,66]. Polymers function by lightening with a film-like shampoo for cosmetics and cosmetic items, such as hair conditioners and masks, and enhancing the cationic surfactant's softening effect. Without assisting to improve joint function hair care, where high hair temperature is required. [67]

Non-ionic & Cationic polymers can be utilized to increase the strength of this form factor. Another popular hair care product is nail paint remover. It's a good hair product to use while using hot appliances like hot irons, curling irons & dryers which can damaged hair due to high heat and friction. The hair is mainly composed of proteins that are modified with minimal damage at high temperatures (200° C), and microspores. [68]. Due to exposure to cuticle cells leading to cell division. The effectiveness of other polymers in capillary thermal protection is investigated by Zhou et al. (2011). They concluded that the first hair treatment with high-density polymers consisting of film changing Hair is obviously protected from thermal damage by groups or hydrophobic units such as polyquaternium 60, VP/acrylates/lauryl methacrylate copolymer, polyethylene carbonate (PEC). [69,70]

3. What are the potential dangerous effect of cosmetic product's on human health?

In cosmetics such as protective or soluble substances such as fragrances, colors, and UV protection in particular are not contraindicated, but the trends persist as lead UV – filter isotiazoliner 4 methylbenzylidene camphor, butyl phthalic acid (BPA) OR methyl benzene, Siloxane D5, Muskxylene or Triclosan [71-72].

4. New trends in Cosmetics :

Polymeric powders have been used as an adjuvant ingredient in a variety of polyamide products, including soft touches with excellent absorptions that are specially combined to provide a non – stick grip, mixing, & soft fell to the back [73]. Reducing powdered ingredients can increase, the emollient effect & sensory perception, just as it can in skin care and sun care [74].

Cosmetic powder, such as Mg₃ Si₄ O₁₀ (OH)₂ powder, is widely use in cosmetic items to fix the skin during and after application, and is not only added to the baby's feet or skin. Polymeric cosmetic powders come in a number of shapes and sizes nowadays. Form, size, density, water absorption, and oil absorption are all different characteristics. For cosmetic engineers, understanding how these structures impact tactile performance will be a valuable design tool. The development of methods to increase the optimum visibility of soft powders based on synthetic polymers is currently generating a lot of interest [75-76]. Significant factors linked to negative environmental effects, on the other hand, are limited to changes in the use of these polymers [77]. PPMA, on the other hand, contains repeating elements one monomer) of methyl methacrylate and methyl methacrylate / glycol di methacrylate (two monomers of Met Methacrylate and ethylene di methacrylate are two types of methyl methacrylate [78]. PSA is commonly included in anti-aging skin care products. PMMA is a non-compliant polymer found in a wide range of cosmetics (eye makeup, other makeup, hair, and nail care), as well as beauty items (filling soft tissues under the skin [79,80]. To reduce, permanent, wrinkles or treat acne atrophic scars, dental implants, toothpaste), and methyl methacrylate cross-polymer can also act as a viscosity, non-aqueous agent PSA is a micro particle resin with a particle size range of four to six microns, which facilitates powder dispersion, suspension, and emulsion formation These polymers form An invisible layer that coats the skin's surface and gives it a silky, smooth feel. Gas and other essential body fluids will also pass, but water cannot evaporate. In addition, the PSA film has an excellent water repellent [81-83]. This was useful for making sunscreens. PSA is used Because of its ability to keep the skin moisturized for a long time and restore small wrinkles, making the skin look thinner and reducing inflammation conditions, it is used in anti-aging products [78]. Polyamide (Nylon 6 or Nylon 12 powder) is a viscous, lipophilic, non-crystalline oil made from a dimer-acid formed by burning vegetable fatty acids over clay [82]. The development of an amide link between certain diamines and mono-alcohol or mono-amine terminators accentuates the characteristics and makes their use and dissemination easier. The PA sheet is modulated through interactions between amines functioning as m-phenylenediamine and the poly functional acyl chloride molecule trimesoylchloride. Reduction of shear can cause these polymers to form gels. From the damaged gel to the transparent appearance of the rod, the Nylon model of 12 gel. With the increasing demand for high-quality skin care products, many studies have developed the development of antimicrobial clothing to protect consumers from minor ailments or odors. Coating can be obtained in situ by using organic Nano particles and metaloxide of tannic acid, chitosan in 12 Nylon fabrics and then throwing them on the surface at high speed to destroy bacteria and prevent biofilm formation [82,83].

CONCLUSION :

Semi-synthetic, Natural & synthetic, and other modified polymers all contain physicochemical and biological chemicals that can be used in cosmetics for the skin, hair care teeth, hair, and nails. They also have the necessary infrastructure to support a wide range of successful cosmetics firms. The exact composition of the polymer is necessary to determine which features are most important in a particular system because these useful properties are continuously linked. Since polymers have different behaviors, they should be

shown not only in terms of the chemicals used, In terms of biopharmaceutical activity, functional qualities, and biological and environmental material safety, as well as biopharmaceutical activity, functional properties, and material safety. It's place a priority on cosmetics' usefulness. With its promise of delivering effective cosmetics safely, the consequential business, particularly its natural section, will continue to grow. However, there are some concerns within the sector that must be addressed.

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