RCMOS – Revista Científica Multidisciplinar O Saber.
ISSN: 2675-9128. São Paulo-SP.

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

Bioingredientes Em Formulações Cosméticas, Suas Perspectivas De Mercado, Status Regulatório E Tendências Futuras: Revisão

Bioingredients In Cosmetic Formulations, Their Market Outlook, Regulatory Status And Future Trends: A Review

Renato Augusto Pereira Damásio - Department of Chemical Engineering, SUNY College of Environmental Science and Forestry – damasiorenato@gmail.com

Resumo

Inúmeros novos materiais têm sido estudados quanto à sua composição e funcionalidade, com foco em seus aspectos de segurança para a produção e o desenvolvimento de novos produtos e materiais para a indústria. Este artigo de revisão investigará o mercado de cosméticos, suas tendências e o status regulatório. Trata-se de um artigo de revisão que visa apresentar a aplicação de bioingredientes na indústria cosmética, suas perspectivas de mercado e o status regulatório, com base em informações públicas e bancos de dados regulatórios disponíveis. O estudo foi realizado no Departamento de Engenharia Química da SUNY College of Environmental Science and Forestry, entre junho de 2025 e janeiro de 2026. Muitas oportunidades podem surgir ao estudarmos novas matérias-primas. É possível combinar as oportunidades que utilizam os compostos presentes na composição química das novas matérias-primas com o processo de produção, permitindo a personalização e o desenvolvimento da composição e funcionalidade dos produtos industrializados. Produtos cosméticos naturais são definidos como produtos que contêm ingredientes naturais de origem animal, vegetal ou mineral, ou seja, derivados de matérias-primas naturais em vez de sintéticas, enquanto um produto cosmético orgânico é definido como aquele que contém ingredientes derivados da agricultura e/ou pecuária orgânica. Nanoceluloses e outras substâncias naturais extraíveis são consideradas bioingredientes que podem ser utilizados com segurança em diversas áreas, como cosméticos, revestimentos especiais e biomedicina. Assim, os cosméticos abrangem uma vasta gama de produtos, e essa classe de produtos é definida considerando as categorias regulamentadas por cada agência reguladora, como FDA, ANVISA e União Europeia. Por fim, é evidente que muitas categorias de cosméticos e funções de ingredientes são regulamentadas de forma específica, de acordo com as leis locais estabelecidas pelas agências. Mesmo com todas as diferenças existentes entre as agências reguladoras, novos bioingredientes derivados de fontes sustentáveis em todo o mundo, como a celulose, têm atraído atenção especial na indústria cosmética.

Palavras-chave: Cosméticos, Índice Natural, Bioingrediente, Nanocelulose

Abstract

Innumerous new materials have been studied regarding their compositions and functionality, exerting their safe aspects into the production and design of new products and materials for the industry. This review paper will investigate the cosmetic market, their trends and regulatory status. This is a review article designed to show the bioingredients application in the cosmetic industry, their market outlook and regulatory status focused on available public information and regulatory databases. The study was carried out in the Department of Chemical Engineering from SUNY College of Environmental Science and Forestry, between June 2025 and January 2026. Many opportunities could be reached when we start studying new raw materials. Joint the opportunities that use the compounds in the chemical composition in the new raw materials to the process to make their achievable tailoring and design the composition and functionality of industrialized products. Natural cosmetic products are identified as products containing natural ingredients of animal, vegetable or mineral derivation, meaning that they derive from raw materials rather than synthetic ones, whereas an organic cosmetic product is identified as containing ingredients that derive from organic agriculture and/or farms. Nanocelluloses and other extractable natural substances are considered bioingredient that can potentially be safely used in many areas, such as cosmetics, special coatings and biomedicine. Thus, cosmetics encompass a vast range of products, this classe of products are defined considering the range of regulated categories for each regulatory agency as FDA, ANVISA and EU. Finally, it is clear

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026
observe that many cosmetic categories and ingredient functions are unique regulated in accordance with the local laws established by the agencies. Even with all existent differences throughout each regulatory agencies, new bioingredients derivate from worldwide sustainable sources, as cellulose, has attract a unique attention considering the cosmetic industry.
Keywords: Cosmetic, Natural indexes, Bioingredient, Nanocellulose

1. INTRODUCTION

Innumerous new materials have been studied regarding their compositions and functionality, exerting their safe aspects into the production and design of new products and materials for the industry.

Considering the popularization of many new ingredients linked to the industries trends the use of natural cosmetics is growing among the population. Beauty products considered as natural bring an approach of association between the environment preservation and health protection. Thus, consumers of that kind of cosmetic search for products with the guarantee that they are natural [36].

The cosmetic industry has been able to respond to changing consumers' preferences for chemical-free cosmetics formulas and to switch to natural and organic cosmetic compounds, which are replacing harmful synthetic substances throughout the entire supply chain. The beauty industry is progressively going green and is moving toward an eco-friendly and ethical dimension. The importance of sustainability is essential to understand how the cosmetic industry has evolved and changed throughout the years. Sustainability has become the base of a new era of capitalism, where all stakeholders and business forces have been affected in different ways and along all the entire products' life cycle. This change, for cosmetic companies, means moving towards innovative formulations, eco-friendly packaging, waste and carbon emissions reduction, research of alternative materials, but also investments on the social and ethical dimension of the beauty world. In fact, sustainability means also working on social and ethical causes, such as human rights protection and animal welfare [37].

From many years of signals and cumulative learning and changes, this industry has been reinvented and presented strong trends building the next steps of the market focused on their ecosystems, consumer wellness and lifestyle throughout the regulation status safe of the commercial products [38].

2. COSMETIC MARKET OUTLOOK AND PATH

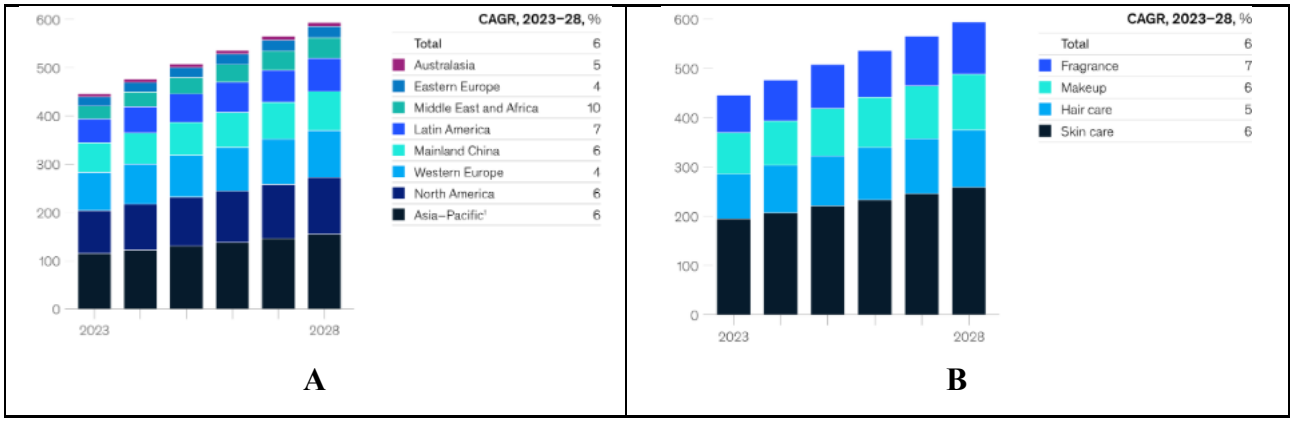
The global beauty market is divided into three main product segments: skincare, haircare, and makeup. However, as highlighted by McKinsey & Company (2024), each category demonstrates distinct growth dynamics and market weight. Figure 1 shows the global beauty market forecast from

RCMOS – Revista Científica Multidisciplinar O Saber.
ISSN: 2675-9128. São Paulo-SP.

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

2023 to 2028 accordingly world region (A) and cosmetic category (B). Skin care dominates the global beauty landscape, accounting for over 44% of total market value, while makeup represents approximately 17%, also is classified as second growing market (Figure 1B) [24, 25].

Figure 1. The global beauty market forecast from 2023 to 2028 accordingly world region (A) and cosmetic category (B) [24,25].



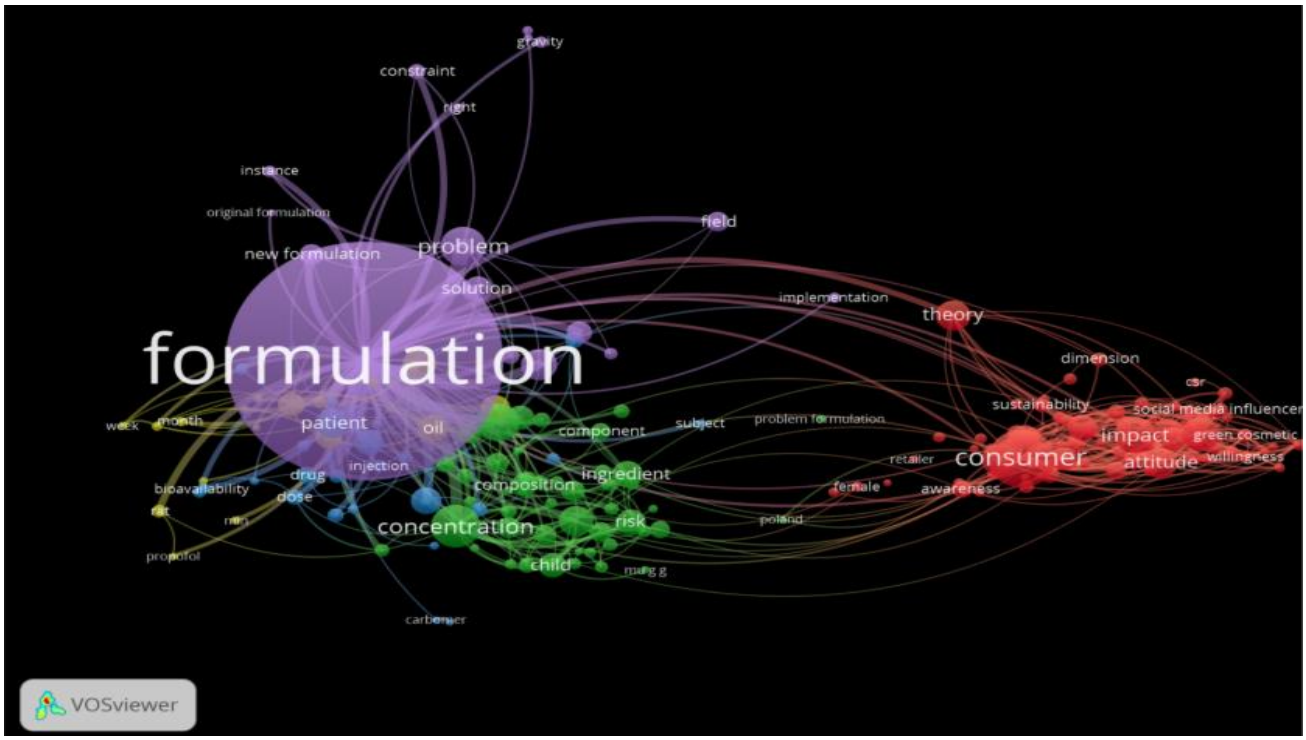
The main markets spread all over the world could be divided in 8 regions as, Australasia, Eastern Europe, Middle East and Africa, Latin America, Mainland China, Western Europe, North America and Asia-Pacific. The most significative growing regions forecasted since 2023 to 2028 are Middle East and Africa, and Latin America, 10 % and 7 % respectively [24,25]. Although Europe remains the most mature and established cosmetics market holding the leading position in global beauty exports by value. However, recent McKinsey research shows that over the past decade, the Middle East & Africa and Latin America have recorded the fastest growth rates in both value and volume [25]. Linked to the major trends and updated cosmetic terms: (1) Skin care presented the fastest growing and largest segment, driven by demand for active ingredients [25]; (2) Haircare showed the second largest category, supported by innovations in scalp health, natural ingredients, and functional formulations [25] and finally (3) Makeup annunciated a dynamic segment shaped by inclusivity, hybrid textures, and the rise of skincare infused beauty products [25].

Figure 2 shows the cosmetic major trends map generated by VOSviewer [1] inputting Clarivate-Web of Science database for general actual cosmetic search [3]. It is relevant to mention the relational map in this case present 4 major groups of input related information generated from the most recent cosmetic databases available in internet. This major groups exemplifies the most significative trends for this area as the formulation, their components, ingredients and available concentration to become a product to interact with the consumer sphere where sustainability, impact and product attitude was the major trends founded.

RCMOS – Revista Científica Multidisciplinar O Saber.
ISSN: 2675-9128. São Paulo-SP.

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

Figure 2. Cosmetics major trends map generated by VOSviewer [1] inputting Clarivate-Web of Science database for general actual cosmetic search [3].



3. COSMETIC INGREDIENTS

Many opportunities could be reached when we start studying new raw materials. Joint the opportunities that use the compounds in the chemical composition in the new raw materials to the process to make their achievable tailoring and design the composition and functionality of industrialized products.

Nanocelluloses and other extractable natural substances are considered bioingredient that can potentially be safely used in many areas, such as cosmetics, special coatings and biomedicine. According to Cosmetics Regulation (EC) No 2009/1223 of the European Parliament and of the Council since 2013, to regulate some chemical materials with different, classes and functions the following definitions shall apply: “(a) ‘cosmetic product’ means any substance or mixture intended to be placed in contact with the external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition or correcting body odors”; “(b) ‘substance’ means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used but excluding any solvent which may be separated without affecting the stability of the substance or

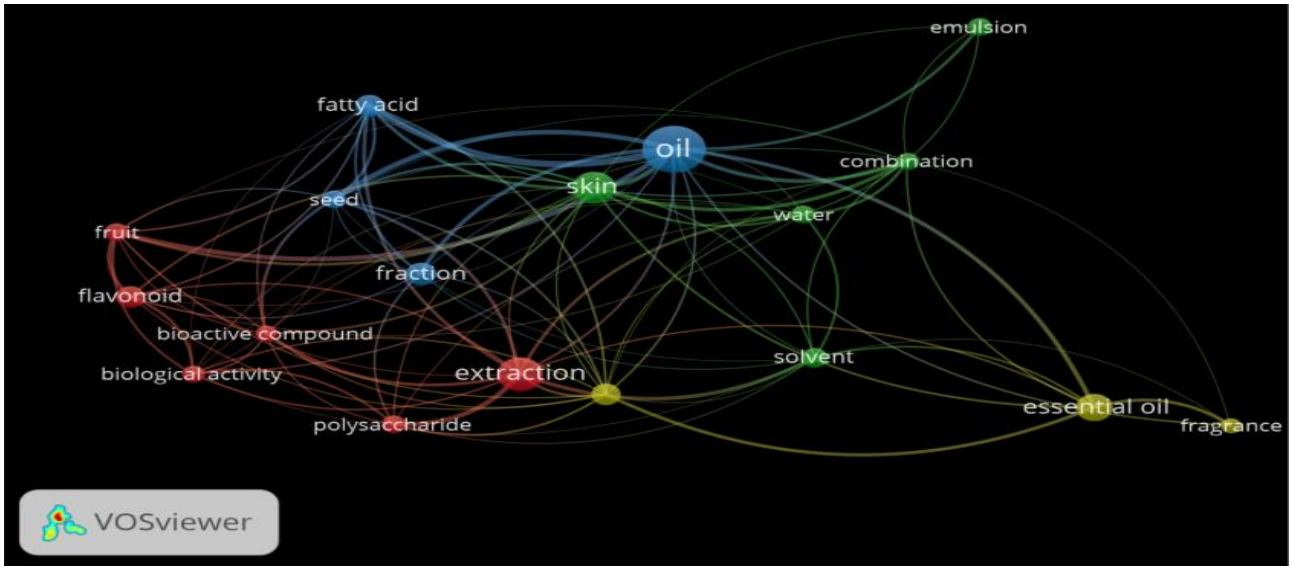
Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

changing its composition"; "(c) 'mixture' means a mixture or solution composed of two or more substances" [29,30].

For the FDA-U.S. Department of Health and Human Services Food and Drug Administration, cosmetic product means a finished cosmetic the manufacture of which has been completed. Any cosmetic product which is also a drug or device, or component thereof is also subject to the requirements of Chapter V of the act. And in addition, the term ingredient means any single chemical entity or mixture used as a component in the manufacture of a cosmetic product [32].

Figure 3 shows a trend map generated by VOSviewer [1] inputting PubMed Science database from 1980 to 2025 [2,33] focused on Cosmetic ingredients and their processes related. In this 45 years old timeline the most significative technical terms and their relation exemplified by the color groups were: fruit, flavonoid, bioactive compound, biological activity, polysaccharide and extraction in red; fatty acid, seed, fraction and oil in blue; skin, water, solvent, combination and emulsion in green; and in yellow, fragrance and essential oils linked to the extraction group. It is important to mention this mental map could change accordingly the database, terms and years of the desired search.

Figure 3. Cosmetic ingredients and their processes map generated by VOSviewer [1] inputting PubMed database from 1980 to 2025 [2].



4. NATURAL FORMULATIONS AND INDEXES

Natural cosmetic products are identified as products containing natural ingredients of animal, vegetable or mineral derivation, meaning that they derive from raw materials rather than synthetic ones, whereas an organic cosmetic product is identified as containing ingredients that derive from organic agriculture and/or farms [35]. Exist many standards and certification agencies that could validate a natural cosmetic, their ingredients and define their indexes. Table 1 shows the standards

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

their certification mechanisms and agencies considering their classification to active indexes of green, organic, natural and major sustainable trends for cosmetics product categories.

Table 1. Standards their certification mechanisms and agency considering their classification to active indexes of green, organic, natural and major sustainable trends for this product category

Cosmetic natural definition accrodinly standards adopted and certification mechanisms						
ID	**Name**	**Description**	**Industrial case**	**Standard**	**Certification type for cosmetics**	**Reference**
1	ISO 16128	Provides a framework for evaluating the naturality of ingredients and cosmetic products. This harmonized methodology ensures transparency in line with our corporate policy and international presence. The standard is divided into two parts: ISO 16128-1:2016 and ISO 16128-2:2017. ISO 16128-1:2016 standard focuses on defining cosmetic ingredients according to their	Colonial Chemical	ISO	-	[10,12,14]

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

		origin. ISO 16128-2:2017 standard defines the calculation methods used to determine natural indices.				
2	Cosmos	The COSMOS ORGANIC signature is available for products that comply with the COSMOS-standard in all respects and contain the required percentages of organic ingredients as specified in the COSMOS-standard. COSMOS NATURAL signature is available for products that comply with the COSMOS-standard in all respects but do not meet the required minimum organic percentages as specified in the	INDIE LEE	COSMOS	(1)Cosmos Organic; (2)Cosmos Natural; (3)Cosmos Certification Bodies	[8,13,16]

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

		COSMOS-standard. The COSMOS BODIES work with manufacturers to provide technical support, COSMOS certification services, auditing and arrange payment for the COSMOS licence fee (applicable to retail products and raw materials).				
3	Ecocert	Assist stakeholders in the implementation and promotion of sustainable practices through certification, consulting and training services. Committed to organic farming since its creation, Ecocert has now extended its efforts to many other sectors. The follow sectors are certified	Acorelle`s, Quintal Lab	COSMOS; ISO; Natrue	(1)Ecocert Organic and Natural Cosmetics; (2)Ecocert Sustainable Wellbeing Center; (3)Green Impact Index; (4)Natrue; (5)ISSO 16128 Raw Material Verification and (5) EcoBeautyScore	[9,15,16,17]

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

		accordinly Ecocert practices: agri-food, homecare, textiles,forestry, cosmetics and sustainable materials.				
4	Natrue	NATRUE's label criteria was to set and build strict requirements for natural and organic cosmetic products, particularly for organic cosmetics, packaging and products' formulations which could not be found in other labels. The NATRUE Label goes hence further than other definitions of "natural cosmetics" established in Europe in terms of consistency and transparency. Natrue label is recognized to certifies (1) Finished	Weleda	NATRUE	(1)NATRUE Finished products; (2)NATRUE Raw materials; (3)NATRUE Formulas	[11,18,19]

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

		products; (2) Raw materials and (3) Formulas.				
5	USDA	Organic certification verifies that your farm or handling facility complies with the USDA organic regulations. Once you are certified, you can sell, label, and represent your products as organic. These regulations describe the specific standards required for you to use the word “organic” or the USDA organic seal on food, feed, or fiber products. USDA certifies: (1)Crops; (2)Livestock; (3)Processed products and (4) Wild products.	Evanhealy	ISO and HACCP	(1) 100% Organic; (2) Organic; (3) Made with organic and (4) Specific Organic Ingredient Listings.	[16,20,21]

RCMOS – Revista Científica Multidisciplinar O Saber.
ISSN: 2675-9128. São Paulo-SP.

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

6	IBD	IBD is the largest certifier in Latin America and the only Brazilian certifier of organic products that is accredited under IFOAM (international market), ISO Guide 65 (European market, rule CE 834/2007), Demeter (international market), USDA/NOP (North American market) and INMETRO / MAPA (Brazilian market), making it's certificate accepted globally.	MARFUGA	Bioagricert and NATRUE	(1) Cosmetic of Natural Origin; (2) Organic Cosmetic and (3) Plant Based Cosmetic for Bioagricert; and (1)NATRUE Finished products; (2)NATRUE Raw materials for NATRUE.	[16,22,23]
7	Other Agencies	The major certification agencies for natural and organic products	Bundesverband Deutscher Industrie und Handelsunternehmen (BDIH) in Germany; National Association for Sustainable Agriculture, Australia (NASAA) in Australia; Soil Association Organic Standard in United Kingdom; Istituto per la Certificazione Etica e Ambientale (ICEA) in Italy; Quality Assurance International (QAI) in United States of America; Oregon Tilth in United States of America.			[16]

RCMOS – Revista Científica Multidisciplinar O Saber.
ISSN: 2675-9128. São Paulo-SP.

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

5. REGULATORY COSMETIC CATEGORIES: FDA *VERSUS* ANVISA *VERSUS* EU

Cosmetics encompass a vast range of products, this classe of products are defined considering the range of regulated categories for each regulatory agency or space. Figure 4 summarize the cosmetics product categories accordingly their agencies in North America, South America and Europe [4,5,6]. It is important to mention that each regulatory agency, country or continent suggest these classes considering their harmonized valid regulations.

FDA consider 17 categories of cosmetic products [4]. The valid categories are: (01) Baby products (02) Bath preparations; (03) Eye makeup preparations (other than children's eye makeup preparations); (04) Children's eye makeup preparations; (05) Fragrance preparations; (06) Hair preparations (non-coloring); (07) Hair coloring preparations; (08) Makeup preparations (not eye)(other than makeup preparations for children); (09) Makeup preparations for children (not eye); (10) Manicuring preparations; (11) Oral products; (12) Personal cleanliness; (13) Shaving preparations; (14) Skin care preparations, (creams, lotions, powder, and sprays); (15) Suntan preparations; (16) Tattoo preparations and (17) Other preparations (i.e., those preparations that do not fit another category) [4].

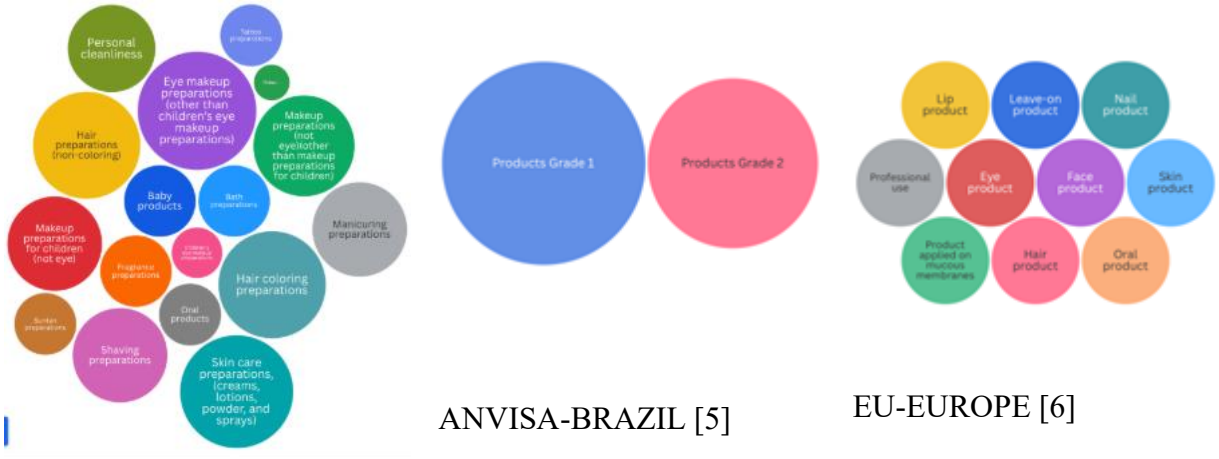
ANVISA consider accordingly the RDC nº 949, de 12/12/2024, another structure of categories considering only 2 main groups divided in Product Grades (1) and (2). Inside of these groups 120 subcategories was listed [5]. The FDA, ANVISA and EU subcategories could be found in the supplementary material of these study.

EU define only 11 categories [6] and list in another regulation their specific classe of functions detailed in 83 different definitions considering the product [34]. The 11 categories are: (a) 'Rinse-off product'; (b)'Leave-on product'; (c) 'Hair product'; (d) 'Skin product'; (e) 'Lip product'; (f) 'Face product'; (g) 'Nail product'; (h) 'Oral product'; (i) 'Product applied on mucous membranes'; (j) 'Eye product' and (k) 'Professional use'.

RCMOS – Revista Científica Multidisciplinar O Saber.
ISSN: 2675-9128. São Paulo-SP.

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

Figure 4. Cosmetics product categories accordingly their agencies in North America, South America and Europe summarized via Flourish [7].



FDA-USA [4] ANVISA-BRAZIL [5] EU-EUROPE [6]

6. NANOMATERIALS DEFINITION: EU *VERSUS* FDA *VERSUS* ANVISA

A wide number of technical terms are different defined in each country or economical region accordingly their regulatory agencies. Considering the most important economical and living spaces in the world, Europe and Americas are significative areas and agencies as EU-Commission to the European Parliament, FDA-U.S. Department of Health and Human Services Food and Drug Administration Center for Food Safety and Applied Nutrition and ANVISA-Brazilian Health Regulatory Agency, present a different definition for nanomaterials.

Accordinly the Commission to the European Parliament, "Nanomaterial" means a natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm - 100 nm. In specific cases and where warranted by concerns for the environment, health, safety or competitiveness the number size distribution threshold of 50 % may be replaced by a threshold between 1 and 50 % [26].

FDA has not established regulatory definitions of “nanotechnology,” “nanomaterial,” “nanoscale,” or other related terms. In June 2014, FDA issued a guidance for industry titled “Considering Whether an FDA-Regulated Product Involves the Application of Nanotechnology”. As described in that guidance, at this time, when considering whether an FDA-regulated product involves

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

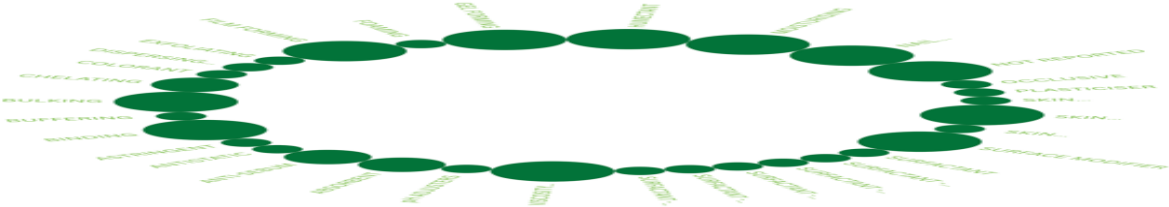
the application of nanotechnology, FDA will ask: (1) whether a material or end product is engineered to have at least one external dimension, or an internal or surface structure, in the nanoscale range (approximately 1 nm to 100 nm); and (2) whether a material or end product is engineered to exhibit properties or phenomena, including physical or chemical properties or biological effects, that are attributable to its dimension(s), even if these dimensions fall outside the nanoscale range, up to one micrometer (1,000 nm). We will apply these considerations broadly to all FDA-regulated products, including cosmetic products [27].

Finally, ANVISA, accordinly the risk classification, notification and marketing authorization systems, as well as labeling requirements and use instructions regarding medical devices define "Nanomaterial": natural, incidental, or manufactured material containing particles in non-attached state or in the form of aggregate or agglomerate, where 50% or more of the number of particles have a size distribution within 1 to 100 nm, in one or more of its external dimensions, which may include: a) fullerenes, graphene flakes, and simple wall carbon nanotubes with one or more external dimensions of less than 1 nm are also considered nanomaterials;b) materials manufactured with dimensions that extrapolate the upper limit of nanoscale (established between 1 and 100 nm), to the landmark of 1000 nm, and which present size- dependent properties or phenomena that are different from those presented by the same material in macroscale, may be included in the definition of nanomaterial [28].

7. SUGESTED CLASSES FOR NANOCELLULOSE APPLICATION

Nanocelluloses have the potential to be qualified as bioingredients for various sectors, among the most challenging are beauty, health and food as being those in which regulations and toxicity and safety tests are required and mandatory [31]. Figure 5 shows the cosmetic suggested classes for nanocellulose application in this study, their recipes or formulation accordingly function and description in EU regulation [6] summarized via Flourish [7] in 3 main categories of importance (Small, medium and large considering the circle size).

Figure 5. Cosmetic suggested classes for nanocellulose application in this study, their recipes or formulation accordingly function and description in EU regulation [6] summarized via Flourish [7] in 3 main categories of importance (Small, medium and large considering the circle size).



Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

8. CONCLUSIONS AND FUTURE OUTLOOK

Innumerous new materials have been studied regarding their compositions and functionality, exerting their safe aspects into the production and design of new products and materials for the industry. The most significative trends for this area as the formulation, their components, ingredients and available concentration to become a product to interact with the consumer sphere where sustainability, impact and product attitude was the major trends founded. Exist many standards and certification agencies that could validate a natural cosmetic, their ingredients and define their indexes accordingly their regulatory agencies and countries. Cosmetics encompass a vast range of products, this classe of products are defined considering the range of regulated categories for each regulatory agency, FDA, ANVISA and EU. Finally, it is clear observe that many cosmetic categories and ingredient functions are unique regulated in accordance with the local laws established by the agencies as FDA, ANVISA and EU. Even with all existent differences throughout each regulatory agencies, new bioingredients derivate from worldwide sustainable sources, as cellulose, has attract an unique attention considering the cosmetic industry.

9. REFERENCES

[1] Centre for Science and Technology Studies, Leiden University. *VOSviewer: Visualizing scientific landscapes.* Updated October 31, 2023. Accessed November 30, 2025. https://www.vosviewer.com

[2] National Library of Medicine. PubMed. Ingredients AND cosmetic [search query]. Updated November 17, 2025. Accessed November 30, 2025. https://pubmed.ncbi.nlm.nih.gov/?term=%28ingredients%29+AND+%28cosmetic%29&sort=&filter=dates.1980%2F1%2F12025%2F11%2F17&filter=articleattr.data&filter=dates.1980%2F1%2F1-2025%2F11%2F17&filter=articleattr.data

[3] Clarivate. Web of Science Core Collection. Accessed November 30, 2025. https://www.webofscience.com/wos/woscc/summary/0a990111-6ce2-4d5e-84b6-bcc46574b42b-018d02a2e1/relevance/1

[4] US Food and Drug Administration. Cosmetic product categories and codes. Updated 2025. Accessed November 30, 2025. https://www.fda.gov/cosmetics/registration-listing-cosmetic-product-facilities-and-products/cosmetic-product-categories-and-codes

[5] Brazil. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução da Diretoria Colegiada – RDC nº 949, de 13 de março de 2024. Brasília, DF: ANVISA; 2024. Accessed November 30, 2025. https://anvisalegis.datalegis.net/action/ActionDatalegis.php?acao=abrirTextoAto&link=S&tipo=RDC&numeroAto=00000949&seqAto=000&valorAno=2024&orgao=RDC/DC/ANVISA/MS&codTipo=&desItem=&desItemFim=&cod_modulo=310&cod_menu=9434

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

[6] European Commission. COSING: Cosmetic Ingredients and Substances Database – Reference Regulations. Brussels, Belgium: European Commission; 2025. Accessed November 30, 2025. https://ec.europa.eu/growth/tools databases/cosing/reference/regulations

[7] Flourish. Visualization: 26544079. Flourish Studio; 2025. Accessed November 30, 2025. https://app.flourish.studio/visualisation/26544079/edit

[8]COSMOSstandard AISBL. COSMOS certification: organic and natural cosmetic product & ingr edient certification. COSMOSstandard. Published 2025. Accessed December 3, 2025. https://www. cosmos-standard.org/en/certification/cosmos-certification/

[9]Ecocert. Cosmetics: certification for organic and natural cosmetic products. Ecocert. Published 2 025. Accessed December 3, 2025. https://www.ecocert.com/en-US/business-sectors/cosmetics

[10]International Organization for Standardization (ISO). ISO 14044:2006— Environmental managementLife cycle assessmentRequirements and guidelines. ISO. Published 200 6. Accessed December 3, 2025. https://www.iso.org/standard/65197.html#lifecycle

[11]NATRUE. Certification process: step by step. NATRUE. Published 2025. Accessed December 3, 2025. https://natrue.org/our-standard/certification-process-step-step/

[12]Sophim. ISO 16128: a standard for assessing the naturality of cosmetic ingredients. Sophim. Pu blished 2023. Accessed December 3, 2025. https://www.sophim.com/en/iso-16128-standard-and-natural-index-in-cosmetics-sophim/

[13] Indie Lee. Squalane Facial Oil Travel Size. Indie Lee Skincare. Published 2025. Accessed December 8, 2025. https://indielee.com/products/squalane-facial-oil-travel

[14] Colonial Chemical, Inc. ISO 16128 – Guidelines on Natural and Organic Cosmetic Ingredients. Colonial Chemical. Published 2025. Accessed December 8, 2025. https://colonialchem.com/company/iso-16128/

[15] Ecocert. Certifications List. Ecocert. Published 2025. Accessed December 8, 2025. https://www.ecocert.com/en/certifications-list

[16] Fonseca-Santos, Bruno & Corrêa, Marcos & Chorilli, Marlus. (2015). Sustainability, natural and organic cosmetics: Consumer, products, efficacy, toxicological and regulatory considerations. Brazilian Journal of Pharmaceutical Science. 51. 17-26. 10.1590/S1984-82502015000100002

[17] Ecco Verde. Ecocert Certified Cosmetics – Page 4. Ecco Verde Online Shop. Published 2025. Accessed December 8, 2025. https://www.ecco-verde.com/categories/ecocert?page=4

[18] NATRUE. Certification Process Step by Step. NATRUE. Published 2025. Accessed December 8, 2025. https://natrue.org/our-standard/certification-process-step-step/

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

[19] Weleda. Certification labels. Weleda website. https://www.weleda.co.uk/natural-ingredients/quality/certifications-labels. . Accessed December 8, 2025.

[20] US Department of Agriculture, Agricultural Marketing Service. Organic labeling. USDA website. https://www.ams.usda.gov/rules-regulations/organic/labeling#4%20labels. . Accessed December 8, 2025.

[21] Evanhealy. Evanhealy website. https://www.evanhealy.com. . Accessed December 8, 2025.

[22]Bioagricert. Cosmetic certification. Bioagricert website. https://www.bioagricert.org/en/certification/no-food-and-other-services/cosmetic/. . Accessed December 8, 2025.

[23] Marfuga Biocosmetics. Biocosmetics—Cosmetici naturali all'olio extravergine di oliva. Marfuga Biocosmetics website. https://www.marfugabiocosmetics.it/en/marfuga-biocosmetics/. . Accessed December 8, 2025

[24] Weaver K, Lesko Pacchia M, Hudson S, Wolfer A, Saint Olive A, Zampouridis A. The beauty boom and beyond: Can the industry maintain its growth? McKinsey & Company. Published September 11, 2024. Accessed December 8, 2025. https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/the-beauty-boom-and-beyond-can-the-industry-maintain-its-growth#/

[25] Weitnauer Group. Global trends in cosmetics market 2025: regional overview. Weitnauer Group website. Published October 14, 2025. Accessed December 8, 2025. https://weitnauer.com/trends-in-cosmetics-market-2025-regional-overview

[26] European Commission. Commission Staff Working Document: SWD(2012) 288. European Commission; 2012. Accessed January 27, 2026. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=swd:SWD_2012_0288

[27] US Food and Drug Administration. Guidance for Industry: Safety of Nanomaterials in Cosmetic Products. US Department of Health and Human Services; 2014. Accessed January 27, 2026. https://www.fda.gov/media/83957/download

[28]Brazilian Health Regulatory Agency (ANVISA). Resolution RDC No. 751/2022: Classification Rules and Requirements for Labeling and Instructions for Use of Medical Devices. ANVISA; 2022. Accessed January 27, 2026. https://www.gov.br/anvisa/ptbr/assuntos/produtosparasaude/temas-em-destaque/arquivos/2024/rdc-751-2022-en.pdf

[29] European Commission (2024) CosIng – Cosmetics Ingredients Database

[30] Damasio RAP, Redmond EF, Costa JC, Aljiboury, A, Eufrade HJ (2025) Protein from Tunicates as Bioingredient: Structure Identification, Application and Regulation. J Nano Res Appl Vol. 11 No. 7:171

[31] DAMÁSIO, Renato Augusto Pereira; PEREIRA, Bárbara Luísa Corradi; GOMES, Fernando

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026
Jose Borges; OLIVEIRA, Rubens Chaves de; COLODETTE, Jorge Luiz. Nanocelulose: breve revisão da produção a regulamentação: Nanocellulose: a brief review from production to regulation. RCMOS - Revista Científica Multidisciplinar O Saber, Brasil, v. 1, n. 2, 2025. DOI: 10.51473/rcmos.v1i2.2025.1296. Disponível em: https://submissoesrevistarcmos.com.br/rcmos/article/view/1296. Acesso em: 27 jan. 2026

[32] US Food and Drug Administration. Cosmetics: General Provisions. 21 CFR Part 700. US Food and Drug Administration; 2024. Accessed January 27, 2026. https://www.ecfr.gov/current/title-21/chapter-I/subchapter-G/part-700

[33] National Library of Medicine. PubMed. National Institutes of Health. Accessed January 27, 2026. https://pubmed.ncbi.nlm.nih.gov

[34] European Commission. CosIng: Functions – Cosmetic Ingredient Functions Reference. European Commission; 2024. Accessed January 27, 2026. https://ec.europa.eu/growth/tools-databases/cosing/reference/functions

[35] Bozza A, Campi C, Garelli S, Ugazio E, Battaglia L. Current regulatory and market frameworks in green cosmetics: the role of certification. Author manuscript version. Published 2022. Accessed January 27, 2026. https://iris.unito.it/retrieve/8f951047-db09-4c8d-bf57-40d07f496c1c/review%20certificazioni.pdf

[36] Barros, C.; Barros, R. B. G. Natural and Organic Cosmetics: Definition and Concepts. Preprints 2020, 2020050374. https://doi.org/10.20944/preprints202005.0374.v2

[37] Girotto G. Sustainability and Green Strategies in the Cosmetic Industry: Analysis of Natural and Organic Cosmetic Products from the Value Chain to Final Certification. [master's thesis]. Venice, Italy: Università Ca' Foscari Venezia; 2012

[38] Mintel. Mintel Announces 2026 Global Beauty and Personal Care Predictions. Mintel. Published 2024. Accessed January 27, 2026. https://www.mintel.com/press-centre/mintel-announces-2026-global-beauty-and-personal-care-predictions/

CONSENT AND ETHICAL APPROVAL

It is not applicable.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare no generative AI technologies such as Large Language Models, etc. have been used.

ACKNOWLEDGEMENT

The authors a would like to acknowledge the Department of Chemical Engineering from SUNY College of Environmental Science and Forestry.

RCMOS – Revista Científica Multidisciplinar O Saber.
ISSN: 2675-9128. São Paulo-SP.

Ano VI, v.1 2026 | submissão: 02/02/2026 | aceito: 04/02/2026 | publicação: 06/02/2026

COMPETING INTERESTS

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.