UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Adolfsson, A., Lenér, F., Marklund, B., Mossberg, K., Çevik‐Aras, H., 2022, Prevalence of Dry Mouth in Adult Patients in Primary Health Care. *Acta Odontologica Scandinavica*, 80(8), 605–610. https://doi.org/10.1080/00016357.2022.2069282

Alam, S., Algahtani, M. S., Ahmad, M. Z., & Ahmad, J., 2020, Investigation Utilizing the HLB Concept for the Development of Moisturizing Cream and Lotion: In-Vitro Characterization and Stability Evaluation. *Cosmetics*, 7(2), 43. https://doi.org/10.3390/cosmetics7020043

Al-Halaseh, L. K., Al-Jawabri, N. A., Tarawneh, S. K., Al-Qdah, W. K., Abu-Hajleh, M. N., Al-Samydai, A. M., Ahmed, M. A., 2022, A Review of the Cosmetic Use and Potentially Therapeutic Importance of Hyaluronic Acid, *Journal of Applied Pharmaceutical Science*, 12(07), 034–041. https://doi.org/10.7324/JAPS.2022.120703

Ambari, Y., Hapsari, F. N.D., Ningsih, A.W., Nurrosyidah, I.H., Sinaga, B., 2020, Studi Formulasi Sediaan Lip Balm Ekstrak Kayu Secang *(Caesalpinia sappan L.)* dengan Variasi Beeswax, *J. Islamic Pharm*, 5(2), 36–45.

Ait-Touchente, Z., Zine, N., Jaffrezic-Renault, N., Errachid, A., Lebaz, N., Fessi, H., Elaissari, A., 2023, Exploring the Versatility of Microemulsions in Cutaneous Drug Delivery: Opportunities and Challenges, *Nanomaterials*, 13(10), 1688. https://doi.org/10.3390/nano13101688

Ardini, D., Sumardilah, D. S., 2021, Efek Lip balm Ekstrak Lidah Buaya (Aloe Vera) Sebagai Pelembab Bibir, *Jurnal Kesehatan Metro Sai Wawa,* 14(1), 10–18.

Ariati, R., Souza, A., Souza, M., Zille, A., Soares, D., Lima, R., Ribeiro, J., 2024, Mechanical and Optical Properties Assessment of an Innovative PDMS/Beeswax Composite for a Wide Range of Applications, *Journal of the Mechanical Behavior of Biomedical Materials*, 160, 106716. https://doi.org/10.1016/j.jmbbm.2024.106716

Arifin, A., Pakki, E., Fitrah, 2023, Formulasi dan Uji Stabilitas Fisik Sediaan Losio Bubur Rumput Laut (*Eucheuma alvarezii* (Doty)) Asal Kabupaten Luwu Sulawesi Selatan, *Jurnal Farmamedika*, 8(2), 174–184.

Azhari., Karolina, R., & Ritonga, S. I., 2022, Karakterisasi termal material menggunakan differential scanning calorimetry (DSC), PT Nasya Expanding Management.

Barboza, F., Vecchia, D. D., Tagliari, M. P., Silva, M. A. S., Stulzer, H. K., 2009, Differential Scanning Calorimetry as a Screening Technique in Compatibility Studies of Acyclovir Extended Release Formulations,

UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Pharmaceutical Chemistry Journal, 43, 363–368. https://doi.org/10.1007/s11094-009-0287-8

Betancur-D'Ambrosio, M. C., Pérez-Cervera, C. E., Barrera-Martinez, C., Andrade-Pizarro, R., 2024, Antimicrobial Activity, Mechanical and Thermal Properties of Cassava Starch Films Incorporated with Beeswax and Propolis, *Journal of Food Science and Technology*, 61(4), 782–789. https://doi.org/10.1007/s13197-023-05878-x

Bîrsan, M., Gore, E., Scripcariu, Ș.-I., Vlad, R.-A., Antonoaea, P., Pintea, C., Pintea, A., Cotoi, C.-T., Focșa, A.-V., & Ciurba, A., 2025, Multi-Active Cosmeceutical Formulations: Stability, Sensory Performance, and Skin Tolerability. *Cosmetics*, *12*(5), 195. https://doi.org/10.3390/cosmetics12050195

Bukhari, S. N. A., Roswandi, N. L., Waqas, M., Habib, H., Hussain, F., Khan, S., Sohail, M., Ramli, N. A., Thug, H. E., Hussain, Z., 2018, Hyaluronic acid, a Promising Skin Rejuvenating Biomedicine: A review of recent updates and pre-clinical and clinical investigations on cosmetic and nutricosmetic effects, *International Journal of Biological Macromolecules,* 120, 1682–1695. https://doi.org/10.1016/j.ijbiomac.2018.09.188

Bushra, R., Ahmad, M., Seidi, F., Qurtulen, , Song, J., Jin, Y., Xiao, H., 2023, Polysaccharide-Based Nanoassemblies: From Synthesis Methodologies and Industrial Applications to Future Prospects, *Advances in Colloid and Interface Science,* 318, 1–37. https://doi.org/10.1016/j.cis.2023.102953

Borkar, V. P., Sakshi, I., Nikita, D., Rishikesh, S., Shubham, W., 2025, Herbal Lip Balm Using Natural Ingredients, *International Journal of Pharmaceutical Research and Applications*, 10(3), 1156–1160. https://doi.org/10.35629/4494-100311561160

Cañadas, O., Casals, C., 2013, Differential Scanning Calorimetry of Protein-Lipid Interactions, Methods in Molecular Biology, 974, 55–71. https://doi.org/10.1007/978-1-62703-275-9_4

Camargo FB Jr, Gaspar LR, Maia Campos PM., 2011, Skin moisturizing effects of panthenol-based formulations, *J Cosmet Sci,* 62(4):361-70. PMID: 21982351.

ChemicalBook, 2024, *D-Panthenol Properties (CAS 81-13-0)*, https://www.chemicalbook.com/ChemicalProductProperty_EN_CB9704179.htm

Chuacharoen, T., Prasongsunk, S., Sabliov, C. M., 2020, ffect of Surfactant Concentrations on Physicochemical Properties and Functionality of Curcumin Nanoemulsions Under Conditions Relevant to Commercial Utilization, Molecules, 24(15), 2744. https://doi.org/10.3390/molecules24152744

UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

CIR (Cosmetic Ingredient Review), 2017, *Safety Assessment of Panthenol, Pantothenic Acid, and Derivatives as Used in Cosmetics*, https://www.cir-safety.org/sites/default/files/panthenol_0.pdf

Dominica, D., dan Handayani, D., 2019, Formulasi dan Evaluasi Sediaan Lotion dari Ekstrak Daun Lengkeng *(Dimocarpus Longan)* sebagai Antioksidan, *Jurnal Farmasi dan Ilmu Kefarmasian Indonesia,* 6(1), 1–7.

Dos Santos, R.D., Matos, B.N., Freire, D.O., da Silva, F.S., do Prado, B.A., Gomes, K.O., de Araújo, M.O., Bilac, C.A., Rodrigues, L.F.S., da Silva, I.C.R., de Sá Barreto, L.C.L., Gomes da Camara, C.A., de Moraes, M.M., Gelfuso, G.M., Orsi, D.C., 2025, Chemical Characterization and Antimicrobial Activity of Essential Oils and Nanoemulsions of *Eugenia uniflora* and *Psidium guajava*, Antibiotics, 14(1), 93. https://doi.org/10.3390/antibiotics14010093

El-Seddawy, F., Abdel-Maboud, M., Barakat, N., Hassaan, M., 2023, Dexpanthenol: New Insights on Wound Healing, a review, *Journal of Advanced Veterinary Research*, 13(7), 1474–1478.

Essendoubi, M., Gobinet, C., Reynaud, R., Angiboust, J. F., Manfait, M., Piot, O., 2016, Human Skin Penetration of Hyaluronic Acid of Different Molecular Weights as Probed by Raman Spectroscopy, *Skin Research and Technology,* 22(1), 55–62. https://doi.org/10.1111/srt.12228

Fallacara A, Baldini E, Manfredini S, Vertuani S., 2018, Hyaluronic Acid in the Third Millennium, *Polymers (Basel),* 10(7):701. doi: 10.3390/polym10070701.

Fernández, R.N., Madrigal, R.G., Chavarría, R.M., Matarrita, B.D., Baltodano, V.E., Carazo, B.G., Pacheco, M.J., 2023, Microemulsion Systems: Generalities and Fields of Application, *European Journal of Pharmaceutical Research*, 3(4), 14–19.

Fomina, P. S., Proskurnin, M. A., Mizaikoff, B., Volkov, D. S., 2022, Infrared Spectroscopy in Aqueous Solutions: Capabilities and Challenges, Critical Reviews in Analytical Chemistry, 52(8), 1748–1765. https://doi.org/10.1080/10408347.2022.2041390

Ghanbari, E., Picken, S. J., van Esch, J. H., 2023, Analysis of Differential Scanning Calorimetry (DSC): Determining the Transition Temperatures, and Enthalpy and Heat Capacity Changes in Multicomponent Systems by Analytical Model Fitting, *Journal of Thermal Analysis and Calorimetry*, 148, 12393–12409. https://doi.org/10.1007/s10973-023-12356-1

Gao, M., Zhao, S., Yang, H., Wu, X., & Xiao, Y., 2024, An Analysis of the Influence of DSC Parameters on the Measurement of the Thermal Properties of Phase-Change Material, *Materials*, *17*(23), 5689. https://doi.org/10.3390/ma17235689

Gao, M., Gao, N., Wang, L., Yao, T., Jing, H., Liu, H., Gao, L., 2025, Evaluation of the Efficacy and Safety of a Panthenol‐enriched Mask for Skin Barrier

UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Recovery After Facial Laser Treatment: Results of a double‐blind randomized controlled study. *Journal of Cosmetic Dermatology, 24*(7), 1–7. https://doi.org/10.1111/jocd.70223

Gautam, N., Kesavan, K., 2017, Development of Microemulsions for Ocular Delivery, *Therapeutic Delivery,* 8, 313–330.

Gharbavi, M., Manjili, H.K., Amani, J., Sharafi, A., Danafar, H., 2019, In Vivo and in Vitro Biocompatibility Study of Novel Microemulsion Hybridized with Bovine Serum Albumin as Nanocarrier for Drug Delivery, *Heliyon*, 5, e01858.

Gunt, H. B., & Ertel, K., 2023, The pH of the lip surface. *Skin Research and Technology, 29*(8), e13438. https://doi.org/10.1111/srt.13438

Hayati, F., Chabib, L., Fauzi, I. T. S., Awaluddin, R., Faizah, W. S., Nasir, M. H. M., & Nipun, T. S. 2020. Effects of pegagan (Centella asiatica L.) ethanolic extract SNEDDS (Self-nanoemulsifying Drug Delivery Systems) on the development of zebrafish (Danio rerio) embryos. Journal of Pharmacy and Bioallied Sciences, 12(4), 457–461.

Hong, G.-W., Choi, W., Yoon, S.-E., Wan, J., & Yi, K.-H., 2025, Anatomical-Based Diagnosis and Filler Injection Techniques: Lips and Philtrum, *Life,* 15(2), 315. https://doi.org/10.3390/life15020315

Illner, M., Kozachynskyi, V., Esche, E., Repke, J.-U., 2022, Fast-Track Realization of Reactive Microemulsion Systems—Systematic System Analysis and Tailored Application of PSE Methods, *Chemical Engineering Science,* 252, 117290.

Jadhav, R. P., Koli, V. W., Kamble, A. B., Bhutkar, M. A., 2020, A Review on Nanoemulsion, *Asian Journal of Research in Pharmaceutical Science*, 10(2), 103–108. https://doi.org/10.5958/2231-5659.2020.00020.X

Jeličić, M.-L., Brusač, E., Amidžić Klarić, D., Nigović, B., Keser, S., & Mornar, A., 2020, Physicochemical Compatibility Investigation of Mesalazine and Folic Acid Using Chromatographic and Thermoanalytical Techniques, *Pharmaceuticals*, *13*(8), 187. https://doi.org/10.3390/ph13080187

Jegasothy, S. M., Zabolotniaia, V., Bielfeldt, S., 2014, Efficacy of a New Topical Nano-hyaluronic Acid in Humans, *Jurnal of Clinical Aesthetic Dermatology,* 7(3), 27–29.

Jiménez-Jiménez, S., Amariei, G., Boltes, K., García, M. Á., Marina, M. L., 2021, Enantiomeric Separation of Panthenol by Capillary Electrophoresis: Analysis of Commercial Formulations and Toxicity Evaluation on Non-target Organisms. *Journal of Chromatography A,* 461919, 1–9. https://doi.org/10.1016/j.chroma.2021.461919

Juncan, A.M., Moisă, D.G., Santini, A., Morgovan, C., Rus, L.L., Vonica-Țincu, A.L., Loghin, F., 2021, Advantages of Hyaluronic Acid and Its

UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Combination with Other Bioactive Ingredients in Cosmeceuticals, *Molecules*, 26(15), 4429. https://doi.org/10.3390/molecules26154429

Kasprzyk, W., Świergosz, T., & Koper, F., 2020, Fluorescence Assay for the Determination of D-Panthenol Based on Novel Ring-Fused 2-Pyridone Derivative, *International Journal of Molecular Sciences*, *21*(21), 8386. https://doi.org/10.3390/ijms21218386.

Kemenkes RI, 2014, *Farmakope Indonesia Edisi V*, Kementrian Kesehatan Republik Indonesia, Direktorat Jenderal Bina Kefarmasian dan Alat Kesehatan.

Kim, J., Yeo, H., Kim, T., Jeong, E.-T., Lim, J. M., Park, S.-G., 2021, Relationship Between Lip Skin Biophysical and Biochemical Characteristics with Corneocyte Unevenness Ratio as a New Parameter to Assess the Severity of Lip Scaling. *International Journal of Cosmetic Science, 43*(3), 275–282. https://doi.org/10.1111/ics.12692

Kim, M. I., Baek, J.-B., & Lee, M. J., 2025, Experimental Study on Thermal Properties and Fire Risk According to Acid Value Change in Palm Oil, *Fire*, *8*(1), 25. https://doi.org/10.3390/fire8010025

Krishnaswamy, V. R., Mintz, D., Sagi, I., 2017, Matrix metalloproteinases: The sculptors of chronic cutaneous wounds, *Biochimica et Biophysica Acta (BBA) - Molecular Cell Research*, 1864(11 Pt B), 2220–2227. https://doi.org/10.1016/j.bbamcr.2017.08.003

Lai-Cheong, J. E., McGrath, J.A., 2021, Structure and Function of Skin, Hair, and Nails, *Medicine*, 49(6), 337–342. https://doi.org/10.1016/j.mpmed.2021.03.001

Larasati, D., Arviani, A., Fatimah, S., Daryanti, E. P., 2024, Inovasi Sediaan Lip Balm Kulit Buah Naga (*Hylocereus polyrhizus*) dengan Beragam Konsentrasi, *Jurnal Mandala Pharmacon Indonesia* (JMPI), 10(2), 673–680. https://doi.org/10.35311/jmpi.v10i2.674

Leyva-Porras, C., Cruz-Alcantar, P., Espinosa-Solís, V., Martínez-Guerra, E., Piñón-Balderrama, C. I., Compean Martínez, I., & Saavedra-Leos, M. Z.., 2020, Application of Differential Scanning Calorimetry (DSC) and Modulated Differential Scanning Calorimetry (MDSC) in Food and Drug Industrie,. *Polymers*, 12(1), 5. https://doi.org/10.3390/polym12010005

Liandhajani, Fitria, N., Ratu, A.P., 2022, Karakteristik dan Stabilitas Sediaan Serum Ekstrak Buah Kersen (Muntingia calabura L.) dengan Variasi Konsentrasi, *Jurnal Farmamedika,* 7(1), 17–27.

Ling, Y., Yu, M., Guo, F., Li, N., Tan, F., 2013, Synergistic Effect of Mixed Cosurfactants on Transdermal Delivery of Indomethacin from O/W Microemulsion, *Chemical Research in Chinese Universities,* 29, 338–343.

UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Liu Q, Huang H, Chen H, Lin J, Wang Q., 2019, Food-Grade Nanoemulsions: Preparation, Stability and Application in Encapsulation of Bioactive 98 Compounds. Molecules. 24(23):4242. doi: 10.3390/molecules24234242.

Lotfollahi, Z., 2024, The Anatomy, Physiology and Function of All Skin Layers and The Impact of Ageing on the Skin. *Wound Practice and Research, 32*(1), 6–10. https://doi.org/10.33235/wpr.32.1.6-10

McKenna, M., Allman, M., Hargest, R., 2024, Surgical Anatomi of the Skin. *Surgery,* 42(11), 781–787. https://doi.org/10.1016/j.mpsur.2024.08.008

Muhammad, P., Novianto, E., Setyorini, M., Legiawati, L., Yusharyahya, S. N., Menaldi, S. L., & Budianti, W. K., 2024, Effectiveness of Topical Hyaluronic Acid of Different Molecular Weights in *Xerosis Cutis* Treatment in Elderly: a Double-blind, Randomized Controlled Trial, *Arch. Dermatol. Res.*, 316–329.

Muliyawan, D., dan Suriana, N., 2013, *Tentang Kosmetik*, Jakarta: PT Elex Media Komputerindo.

Nelson, M. L., Thrane, L. W., Codd, S. L., Cape, J. L., Craig, C. D., Pluntze, A., Seymour, J. D., 2025, Observing Solid–Solid Phase Transitions in Two Alkanes and Natural Wax with Multidimensional NMR Relaxometry. *Applied Magnetic Resonance*, 56(6), 723–747. https://doi.org/10.1007/s00723-025-01751-6

Östbring, K., Matos, M., Marefati, A., Ahlström, C., & Gutiérrez, G., 2021, The Effect of pH and Storage Temperature on the Stability of Emulsions Stabilized by Rapeseed Proteins, *Foods*, *10*(7), 1657. https://doi.org/10.3390/foods10071657.

Özsin, G., 2025, Exploring the Thermal Degradation of Bakelite: Non-Isothermal Kinetic Modeling, Thermodynamic Insights, and Evolved Gas Analysis via Integrated In Situ TGA/MS and TGA/FT-IR Techniques, *Polymers*, *17*(16), 2197. https://doi.org/10.3390/polym17162197

Peng, J.H., Peng, P.H., 2020, HA Filler Injection and Skin Quality: Literature minireview and injection techniques. *Indian Journal of Plastic Surgery*, 53(2), 198–206. https://doi.org/10.1055/s-0040-1715545

Piccinin, M. A., Zito P. M., 2024, *Anatomy, Head and Neck, Lips*, StatPearls Publishing LLC.

Qin, X., dan Zhong, J., 2016, A review of extraction techniques for avocado oil, *J. Oleo Sci*, 65(11), 881–888.

Rahmani, A. R., 2025, Optimasi Emolien Virgin Coconut Oil dan Humektan Gliserin Formula Lip Balm dengan Ekstrak Etanol Kulit Semangka Merah (Citrullus lanatus (Thunb.) Matsum. & Nakai) sebagai Penangkal Radikal Bebas dan Radiasi Sinar UV, *Skripsi*, Fakultas Farmasi Universitas Gadjah Mada Yogyakarta.

UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Rasyadi, Y., Agustin., Aulia, G., Merwanta, S., Hanifa, D, 2021, Formulasi Lip Balm Ekstrak Etanol Bunga Kecombrang (*Etlingera elatior (Jack)*) dan Uji Stabilitas Menggunakan Metode *Freeze and Thaw*, *Jurnal Ilmiah Farmasi*, 10(2), 54-61.

Riangjanapatee, P., Khongkow, M., Treetong, A., Unger, O., Phungbun, C., Jaemsai, S., Bootsiri, C., Okonogi, S., 2022, Development of Tea Seed Oil Nanostructured Lipid Carriers and In Vitro Studies on Their Applications in Inducing Human Hair Growth, Pharmaceutics, 14(5), 984. https://doi.org/10.3390/pharmaceutics14050984

Rowe, R.C., Sheskey, P.J., Owen, S.C., 2006, Handbook of Pharmaceutical Excipients, Pharmaceutical Press and American Pharmacists Association.

Rowe, R.C., dkk., 2009, *Handbook of Pharmaceutical Excipients,* sixth edition, Pharmaceutical Press.

Ryu, K. A., Park, P. J., Kim, S. B., Bin, B. H., Jang, D. J., Kim, S. T., 2020, Topical delivery of coenzyme Q10-loaded microemulsion for skin regeneration, *Pharmaceutics*, 12(4), 332, https://doi.org/10.3390/pharmaceutics12040332

Saiwaeo, S., Arwatchananukul, S., Mungmai, L., Preedalikit, W., Aunsri, N., 2023, Human Skin Type Classification Using Image Processing and Deep Learning Approaches, *Heliyon, 9*(10), 1–17, https://doi.org/10.1016/j.heliyon.2023.e21176

Safithri F.Y., 2025, Optimasi Emolien dan Humektan Formula Lip Balm dengan Ekstrak Kulit Buah Naga Merah (Hylocereus polyrhizus (F. A. C Weber) Britton & Rose) sebagai Penangkal Radikal Bebas dan Anti Radiasi Sinar UV, *Skripsi*, Fakultas Farmasi Universitas Gadjah Mada Yogyakarta

Salsabiil, R. A., 2025, Eksplorasi Leguminosae dan Piperaceae sebagai Sumber Alternatif Senyawa Bakuchinol sebagai Anti-aging: Maserasi dan Pembuatan Sediaan Mikroemulsi, *Skripsi*, Fakultas Farmasi Universitas Gadjah Mada Yogyakarta.

Shang, J., Feng, X., Chen, Y., Gu, Z., Liu, Y., 2024, Human lip vermilion: Physiology and Age-related Changes. *Journal of Cosmetic Dermatology, 23*(8), 2676–2680. https://doi.org/10.1111/jocd.16317

Shena, K., Kumar, A., 2022, Nanoemulsions: Techniques for the preparation and the recent advances in their food applications, *Innovative Food Science and Emerging Technologies, 76,* 102914.

Silva, E. P., Pereira, M. A. V., Lima, I. P. B., Lima, N. G. P. B., Barbosa, E. G., Aragão, C. F. S., Gomes, A. P. B., 2016, Compatibility Study Between Atorvastatin and Excipients Using DSC and FTIR, Journal of Thermal Analysis and Calorimetry, 123(2), 933–939. https://doi.org/10.1007/s10973-015-5059-8

UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Sinaga, D., 2022, *Metodologi Penelitian (Penelitian Kuantitatif)*, Cetakan I, UKI Press, Jakarta.

Skotnicki, M., Aguilar, J. A., Pyda, M. danHodgkinson, P., 2015, Bisoprolol and Bisoprolol-Valsartan Compatibility Studied by Differential Scanning Calorimetry, Nuclear Magnetic Resonance and X-Ray Powder Diffractometry, *Pharmaceutical Research*, 32(2), 414–429.

Souto, E. B., Cano, A., Martins-Gomes, C., Coutinho, T. E., Zielińska, A., & Silva, A. M, 2022, Microemulsions and Nanoemulsions in Skin Drug Delivery, *Bioengineering*, 9(4), 158. https://doi.org/10.3390/bioengineering9040158

Souto, E. B., Fernandes, A. R., Martins-Gomes, C., Coutinho, T. E., Durazzo, A., Lucarini, M., Souto, S. B., Silva, A. M., Santini, A., 2020, Nanomaterials for Skin Delivery of Cosmeceuticals and Pharmaceuticals. *Applied Sciences*, 10(5), 1594. https://doi.org/10.3390/app10051594

Suhail, N., Alzahrani, A.K., Basha, W.J., Kizilbash, N., Zaidi, A., Ambreen, J., Khachfe, H.M., 2021, Microemulsions: Unique Properties, Pharmacological Applications, and Targeted Drug Delivery, *Frontiers in Nanotechnology*, 3, 754889.

Sujatha, B., Himabindu, E., Bttu, S., Abbulu, K., 2020, Microemulsions – A Review, *Journal of Pharmaceutical Sciences and Research,* 12(6), 750–75.

Sujuliyani, Pebriyanti, P., Sipahutar, Y.H., 2021, Formulasi Kapa dan Iota Karagenan dalam Pembuatan Produk Kosmetik Pelembab Bibir, *Jurnal Pengolahan Hasil Perikanan Indonesia,* 24(3), 330–336.

Shukla, T., Upmanyu, N., Agrawal, M., Saraf, S., Saraf, S., Alexander, A., 2018, Biomedical Applications of Microemulsion through Dermal and Transdermal Route, *Biomedicine & Pharmacotherapy,* 108, 1477–1494.

Szumała, P., Kaplinska, J., Makurat-Kasprolewicz, B., Mania, S., 2023, Microemulsion Delivery Systems with Low Surfactant Concentrations: Optimization of Structure and Properties by Glycol Cosurfactants, Molecular Pharmaceutics, 20, 232–240.

Tampucci, S., Paganini, V., Burgalassi, S., Chetoni, P., & Monti, D., 2022, Nanostructured Drug Delivery Systems for Targeting 5-α-Reductase Inhibitors to the Hair Follicle, *Pharmaceutics*, 14(2), 286. https://doi.org/10.3390/pharmaceutics14020286

Utama, K. J. R., 2023, Evaluasi Kompatibilitas secara Fisikokimia Tokoferol dengan Tiamin, *Skripsi*, Fakultas MIPA, Program Studi Farmasi, Universitas Sebelas Maret.

Vignesh, S., Anandu, P. M., Varrier, G. S. G., Brijmohan, N., Krishnan, G. G., Ganesh, S. K., Nair, S. R., Mohanasrinivasan, V., Devi, C. S., 2025, Production and extraction of red bioactive pigment from *Streptomyces*

UNIVERSITAS
GADJAH MADA
**Preformulasi dan Uji Kompatibilitas Zat Aktif Sediaan Mikroemulsi Lip Balm Kombinasi Hyaluronic Acid
dan Panthenol Menggunakan Metode Differential Scanning Calorimetry (DSC)**
Lia Nur Arifah, Dr. apt. Nindya Kusumorini, S.Farm
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

griseorubiginosus and formulation of bio-lip balm. *Indian Journal of Microbiology,* *65*(2), 961–970. https://doi.org/10.1007/s12088-024-01323-5

Warapsari, N. A. W., Hasriyani, H., Sukoharjanti, B. T., 2025, Pengaruh basis campuran beeswax dan carnauba wax terhadap sifat fisik dan kadar SPF pada formulasi sediaan lip balm ekstrak buah murbei (*Morus alba* L.), *Journal of Innovative and Creativity*, 5(3), 25522–25538.

Wesolowski, M., 2025, Methods of Thermal Analysis as Fast and Reliable Tools for Identification and Quantification of Active Ingredients in Commercially Available Drug Products, *Pharmaceutics*, *17*(9), 1099. https://doi.org/10.3390/pharmaceutics17091099

Wiyono, A.E., Safitri, I.A., Rusdianto, A.S., Choiron, M., Masahid, A.D., 2023, Optimization of the Combination of CMC-Na and Glycerin in Tobacco (*Nicotiana tabacum* L.) Hand Sanitizer Gel Using the Simplex Lattice Design, International Journal on Food, Agriculture, and Natural Resources, 4(1), 10–17. https://doi.org/10.46676/ij-fanres.v4i1.108

Wu, W.-T., Chang, K.-V., Naňka, O., Chang, H.-C., Ricci, V., Mezian, K., Özçakar, L., 2025, Lip sonoanatomy and Relevance to Aesthetic Filler Injections: A pictorial review, *Journal of Cosmetic Dermatology*, 24(4), 1–11. https://doi.org/10.1111/jocd.70164

Zhang, X., Kerob, D., Zhang, Z., Tao, H., He, X., Yi, Y., Fang, X., Wang, W., Steel, A., 2024, Efficacy and Safety of a Cream Containing Panthenol, Prebiotics, and Probiotic Lysate for Improving Sensitive Skin Symptoms, *Skin Research and Technology*, 30(1), 13540. https://doi.org/10.1111/srt.13540

Zhuang, C., Xiang, J., 2025, Application of Differential Scanning Calorimetry in Study of Steel and Alloys, Iron and Steel, 60(3), 13–25. https://doi.org/10.13228/j.boyuan.issn0449-749x.20240518