

# Table of Contents

## Preface

## Chapter 1: Materials for Pharmaceutical and Biomedical Application

|                                                                                                                                                                                                                                                           |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Mechanical Properties of Pectin/Eudragit Blend Films</b><br>Y. Sampaopan and J. Suksaeree                                                                                                                                                              | 3  |
| <b>Porous Hydroxyapatite/Chitosan/Carboxymethyl Cellulose Scaffolds with Tunable Microstructures for Bone Tissue Engineering</b><br>K. Wongsawichai, E. Kingkaew, E. Pariyaisut and S. Khondee                                                            | 9  |
| <b>Folate-Functionalized Amphiphilic Chitosan Polymeric Micelles Containing Andrographolide Analogue (3A.1) for Colorectal Cancer</b><br>T. Kansom, E. Dumkhang, P. Patrojanasophon, W. Sajomsang, R. Saeeng, W.M. Zhu and P. Opanasopit                  | 15 |
| <b>Catechol-Functionalized Succinyl Chitosan for Novel Mucoadhesive Drug Delivery</b><br>N. Sahatsapan, T. Rojanarata, T. Ngawhirunpat, P. Opanasopit and P. Patrojanasophon                                                                              | 21 |
| <b>Electrostatic Effects of Metronidazole Loaded in Chitosan-Pectin Polyelectrolyte Complexes</b><br>S. Limsitthichaikoon and C. Sinsuebpol                                                                                                               | 27 |
| <b>Fabrication of Enteric Release Tablet without Coating Process by Using Bleached Shellac</b><br>M. Luangtana-anan, S. Limmatvapirat and S. Saengsod                                                                                                     | 33 |
| <b>Optimization of <i>Boesenbergia rotunda</i> Extract-Loaded Polyvinyl Alcohol Hydrogel Wound Dressing by Box-Behnken Design</b><br>P. Eakwaropas, Y.Y. Myat, T. Ngawhirunpat, T. Rojanarata, P. Patrojanasophon, P. Akkaramongkolporn and P. Opanasopit | 38 |
| <b>Evaluation of Thermally Crosslinked Poly(Acrylic Acid-Co-Maleic Acid) (PAMA)/Poly(Vinyl Alcohol) (PVA) Microneedle Arrays</b><br>N.N. Aung, Y.Y. Myat, T. Ngawhirunpat, T. Rojanarata, P. Patrojanasophon, P. Opanasopit and B. Pamornpathomkul        | 45 |
| <b>Polymethacrylates as Polymeric Film Formation in Patches Containing <math>\alpha</math>-Mangostin and Resveratrol</b><br>W. Samprasit, B. Chamsai and P. Opanasopit                                                                                    | 51 |
| <b>Formulation of Chitosan-Ethylenediaminetetraacetic Acid/Poloxamer Gel Containing Fruit's Hull of <i>Garcinia mangostana</i> Extract</b><br>N. Charernsriwilaiwat, A. Manatkasemsak, K. Thunyamanorot and N. Thawornkhun                                | 57 |
| <b>Natural Furanocoumarin as Potential Oral Absorption Enhancer</b><br>M.P.T. Maw, P. Phattanawasin, U. Sotanaphun and N. Piyapolrungsroj                                                                                                                 | 63 |

## Chapter 2: Cosmetic Ingredients

|                                                                                                                                                                                                                                   |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Extraction Method of Protein and Insulin-Like Growth Factor-1 from Deer Antler Velvets for Skin Rejuvenation</b><br>W. Rangsimawong, K. Tansathien, A. Wattanakul, T. Ngawhirunpat and P. Opanasopit                           | 73 |
| <b>Stability of Mangiferin in Lotion and its Antioxidant Activity</b><br>A. Jutiviboonsuk and W. Leeprechanon                                                                                                                     | 79 |
| <b><i>In Vitro</i> Antibacterial Activity of Hydrogels Containing Tamarind Seed Husk Extracts against <i>Propionibacterium acnes</i></b><br>N. Baisaeng and S. Klayraung                                                          | 85 |
| <b>Development of Microemulsions Containing <i>Carthamus tinctorius</i> Extract for 5<math>\alpha</math>-Reductase Inhibition</b><br>S. Soradech, K. Panapong, S. Soonthornsatitwong, S. Manchun, S. Tubtimted and P. Kusolkumbot | 92 |
| <b>Characteristic Assessment of the Polymeric Films Used for Hair Gel Products in Thailand</b><br>S. Taokaew, S. Phonsee, N. Woravut, T. Pitaksuteepong and W. Kriangkrai                                                         | 98 |

|                                                                                                                                                                                                                                                                 |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Development of Thai Gac Fruit Extraction as a Multifunctional Cosmeceutical Ingredient for Antioxidant, Melanogenesis and Collagen Stimulating Activities</b><br>S. Reungpatthanaphong, K. Chawanoraset, T. Kirdin, M. Bamrungchai and P. Reungpatthanaphong | 104 |
| <b>Antioxidant, Antityrosinase Activity and Toxicity of <i>Alpinia nigra</i> Extracts</b><br>P. Janyapanich, C. Kotipan, K. Teerachawalwong, S. Watana and N. Nuntharatanapon                                                                                   | 111 |
| <b>Anti-Melanogenic Activity of <i>p</i>-Chlorophenyl Benzyl Ether in <math>\alpha</math>-MSH-Induced Mouse Melanoma B16F10 Cells</b><br>W. Riam-Amatakun, P. Limpachayaporn, J.R.L. Pizon, P. Opanasopit and N. Nuntharatanapon                                | 118 |
| <b>Biological Activities and Dermal Penetration of Liposome-Containing <i>Coprinus atramentarius</i> Extract</b><br>P. Sobharaksha, R. Indranupakorn and S. Manchan                                                                                             | 124 |
| <b>Formulation and Evaluation of Antifungal Shampoo Containing Modified Coconut Oil for <i>Tinea Capitis</i> Treatment</b><br>S. Tubtimsri, N. Saewon, N. Khonsungdee, R. Rodjanabumrungwong and S. Limmatvapirat                                               | 130 |

### Chapter 3: Nanomaterials and Nanoproducs

|                                                                                                                                                                                                                                                                                        |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Andrographolide-Loaded Nanoemulsion and its Activity against Non-Melanoma Skin Cancer Cells</b><br>N. Sooksai, W. Treesuppharat, S. Theeramunkong and R. Asasutjarit                                                                                                                | 139 |
| <b>Dual-Charge Nanofiber Mats Made of Chitosan(CS)/Poly(Vinyl Alcohol) (PVA) and Poly-(Acrylic Acid-Co-Maleic Acid) (PAMA)/PVA</b><br>T. Chareonying, J.M. Sakilan, T. Rojanarata, P. Patrojanasophon, P. Akkaramongkolporn and P. Opanasopit                                          | 145 |
| <b>PEGylated Plier-Like Cationic Niosomes on Gene Delivery in HeLa Cells</b><br>S. Pengnam, S. Plianwong, K. Singpanna, N. Ni-yomtham, W. Radchatawedchakoon, B.E. Yingyongnarongkul and P. Opanasopit                                                                                 | 151 |
| <b>Physical Stability of Astaxanthin from <i>Haematococcus pluvialis</i> Loaded in Micromeulsion as a Cosmetic Ingredient for Melanogenesis Inhibition</b><br>P. Kusolkumbot, K. Panapong, K. Kingkeaw, S. Soonthornsatitwong, S. Manchun and S. Soradech                              | 157 |
| <b>Catechol-Bearing Hyaluronic Acid Coated Polyvinyl Pyrrolidone/Hydroxyl Propyl-<math>\beta</math>-Cyclodextrin/Clotrimazole Nanofibers for Oral Candidiasis Treatment</b><br>C. Pornpitchanarong, K. Singpanna, T. Rojanarata, P. Opanasopit, T. Ngawhirunpat and P. Patrojanasophon | 163 |
| <b>Niosomes Containing Spermine-Based Cationic Lipid with Different Linkers for siRNA Delivery</b><br>S. Pengnam, P. Opanasopit, T. Rojanarata, N. Ni-yomtham, B.E. Yingyongnarongkul and S. Plianwong                                                                                 | 169 |
| <b>Solid Lipid Nanoparticles Containing <i>Pueraria mirifica</i> Ethanolic Extract for Hair Growth Promotion</b><br>K. Tansathien, N. Nuntharatanapon, S. Jaewjira, J.R.L. Pizon, P. Opanasopit and W. Rangsimawong                                                                    | 175 |
| <b>Development of Nanoemulsions Containing Coconut Oil with Mixed Emulsifiers: Effect of Mixing Speed on Physical Properties</b><br>S. Pengon, W. Suchaoin, C. Limmatvapirat and S. Limmatvapirat                                                                                      | 181 |
| <b>Design of Caffeine-Loaded Nanostructured Lipid Carriers Containing Coconut Oil for Topical Application</b><br>S. Manchun, S. Soradech, K. Kingkaew, P. Sobharaksha, P. Srimornsak and S. Tubtimted                                                                                  | 187 |

### Chapter 4: Technologies of Materials Modification and Processing

|                                                                                                                                                          |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Mixed Solvent-Lauric Acid Solvent-Exchange Induced <i>In Situ</i> Forming Gel</b><br>T. Chantadee, W. Santimaleeworagun, Y. Phorom and T. Phaechamud  | 195 |
| <b>Alpha-Mangostin Phase Inversion Induced <i>In Situ</i> Forming Gel</b><br>S. Senarat, T. Chantadee, W. Santimaleeworagun, Y. Phorom and T. Phaechamud | 202 |
| <b>Characterization of Lauric Acid Precipitated from Biocompatible Solvents</b><br>N. Puyathorn, T. Chantadee, S. Senarat and T. Phaechamud              | 209 |

|                                                                                                                                                                                                                                               |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Gamboge Resin-Based Phase Separation <i>In Situ</i> Forming Gel</b><br>E.M. Khaing, T. Chantadee, T. Intaraphairot and T. Phaechamud                                                                                                       | 215 |
| <b>Matrix Forming Behavior of Doxycycline Hyclate-Loaded Beta-Cyclodextrin <i>In Situ</i> Forming Matrix and Microparticle</b><br>N. Lertsuphotvanit, P. CHAIYA and T. Phaechamud                                                             | 221 |
| <b>Application of Simplex Lattice Design in Formulation Development of Lozenges Containing <i>Vernonia cinerea</i> Extract for Smoking Cessation</b><br>C. Monton, T. Sangprapai, N. Mekwimonmas, T. Sawangsang, N. Chankana and C. Luprasong | 227 |
| <b>Development and Evaluation of Acetaminophen Orodispersible Disc with Taste-Masking Property</b><br>P. Trirattanapintusorn, S. Leatpianpanit, P. Thanarangsarit, S. Sungthongjeen and W. Kriangkrai                                         | 233 |
| <b>Development and Evaluation of Hydroxypropyl Methylcellulose Patches Containing Clindamycin for Topical Application</b><br>P. Suriyaamporn, T. Kasemsawat, B. Sirilert, K. Apiromrak, P. Patrojanasophon, Y.Y. Myat and S. Panomsuk         | 240 |
| <b>Effect of Formulations and Spray Drying Process Conditions on Physical Properties of Resveratrol Spray-Dried Emulsions</b><br>P. Benjasirimongkol, S. Piriyaprasarth and P. Srimornsak                                                     | 246 |
| <b>Influence of Process Parameters on the Characteristics of Hydrophilic Drug-Loaded Microparticles through Double Emulsion Solvent Evaporation Technique</b><br>L. Sutthapitaksakul and P. Srimornsak                                        | 252 |