# بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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**Faculty of Pharmacy**
**Department of Pharmaceutics and Industrial Pharmacy**

# Development and Optimization of Liquid Crystalline Nanostructures for Enhanced Ocular Delivery

A Thesis submitted by

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Assistant Lecturer at Department of Pharmaceutics and Pharmaceutical Technology
Faculty of Pharmacy, Future University in Egypt

for partial fulfillment of the requirements for

**The Degree of Doctor of Philosophy**

**in Pharmaceutical Sciences**

**(Pharmaceutical Technology)**

Under the supervision of

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# Approval Sheet

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# *Development and Optimization of Liquid Crystalline Nanostructures for Enhanced Ocular Delivery*

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# List of Contents

# List of Abbreviations

| | |
|---|---|
| **AH** | Aqueous humor |
| **BAC** | Benzalkonium chloride |
| **BBB** | Blood brain barrier |
| **BQ** | Bedaquiline |
| **BQLC** | BQ-loaded cubosome |
| **CAM** | Chorioallantoic membrane |
| **CDs** | Cyclodextrins |
| **CLSM** | Confocal laser scanning microscope |
| **CPP** | Critical packing parameter |
| **cryo-TEM** | Cryo-transmission electron microscopy |
| **CXB** | Celecoxib |
| **Cys A** | cyclosporin A |
| **DADLE** | [D-Ala2, D-Leu5] enkephalin |
| **DEX** | Dexamethasone |
| **DLS** | Dynamic light scattering |
| **DSC** | Differential scanning calorimetry |
| **EE** | Entrapment efficiency |
| **EGFR** | Epidermal growth factor receptor |
| **EPR** | Enhanced permeability and retention |
| **FB** | Flurbiprofen |
| **FI** | Finasteride |
| **FP** | Prostaglandin F receptor |
| **GL-HCl** | Glucosamine hydrochloride |
| **GMO** | Glyceryl monooleate |
| **GRAS** | Generally regarded as safe |
| **h** | hour |
| **HET-CAM** | Hen's egg test-chorioallantoic membrane test |
| **HII** | Inverse hexagonal mesophase |
| **HPLC** | High performance liquid chromatography |

| | |
|---|---|
| **HR-TEM** | High resolution transmission electron microscope |
| **Im3m** | Primitive cubic mesophases |
| **IOP** | Intraocular pressure |
| **IPMS** | Infinite periodic minimum surface |
| **Jss** | Steady state flux |
| **KGy** | Kilo gray |
| **Kp** | permeability coefficient |
| **KZ** | Ketoconazole |
| **L3** | Sponge phase |
| **LC-MS-MS** | Liquid chromatography–mass spectrometry- mass spectrometry |
| **LCNs** | Liquid crystalline nanostructures |
| **LDA** | Laser Doppler Anemometry |
| **LLC** | Lyotropic liquid crystals |
| **MCT** | Medium-chain triglycerides |
| **min** | minute |
| **MO** | Monoolein |
| **MRI** | Magnetic resonance imaging |
| **NAD** | Nicotinamide Adenine Dinucleotide |
| **NFX** | Norfloxacin |
| **NPs** | Nanoparticles |
| **NS** | Nano-sponge |
| **NSCLC** | Non-small cell lung cancer |
| **Or** | Oregano oil |
| **P407** | Poloxamer 407 |
| **PA** | Peak area |
| **PBS** | Phosphate buffer saline |
| **PD** | Pharmacodynamics |
| **PDI** | Polydispersity index |
| **PEG** | Polyethylene glycol |
| **PEO** | Polyethylene oxide |
| **PEs** | Penetration enhancers |

| | |
|---|---|
| **PET** | Positron emission tomography |
| **PFD** | Pirfenidone |
| **PG** | Prostaglandin |
| **PK** | Pharmacokinetics |
| **Pn3m** | Double diamond cubic mesophases |
| **PpIX** | Photosensitizer protoporphyrin IX |
| **PPO** | Polypropylene oxide |
| **PS** | Particle size |
| **PTX** | paclitaxel |
| **PYT** | Phytantriol |
| **QII** | Inverse bicontinuous cubic mesophase |
| **RhoB** | Lissamine rhodamine |
| **RI** | Irritation index |
| **RPE** | retinal pigment epithelium |
| **rpm** | Round per minute |
| **RSM** | Response surface methodology |
| **SAA** | Surfactant |
| **SAXS** | Small-angle x-ray scattering |
| **SIM** | Simvastatin |
| **SIM-CB** | Simvastatin loaded cubosomes |
| **SNEDDS** | Self-nanoemulsifying drug delivery systems |
| **SPECT** | Single photo emission computed tomography |
| **STZ** | Sertaconazole nitrate |
| **TET** | Tetrandrine |
| **TM** | Timolol Maleate |
| **TPGS** | D-α-Tocopherol polyethylene glycol 1000 succinate |
| **TRAVO** | Travoprost |
| **TRAVO-LCNs** | Travoprost loaded liquid crystalline nanostructures |
| **VAN** | Vancomycin |
| **XRPD** | X-ray powder diffraction |

| | |
|---|---|
| **ZP** | Zeta potential |
| **µm** | Micrometer |