## Biography

## WAEL MAMDOUH

## E-mail: wael\_mamdouh @aucegypt.edu, Office: +20.2.2615.2555

***Leader, Biomedical Polymer Nanocomposites, Hydrogels, and Tissue Engineering*** ***Group***
The American University in Cairo (AUC), AUC Avenue, P.O. Box 74, New Cairo 11835, Egypt

Dr. Wael Mamdouh is a “Professor of Nanotechnology” at the Department of Chemistry, School of Science and Engineering at the American University in Cairo (AUC). He is also the head of the research team for “Biomedical polymer Nanocomposites, Hydrogels, and Tissue Engineering” at AUC since 2011.

**Education**

Dr. Mamdouh received his M.Sc. and Ph.D. degrees in Chemistry and Nanotechnology from the Katholieke Universiteit Leuven (KUL) in Belgium (one of the top 40 worldwide) in 2002 and 2005 respectively, and B.Sc. degree in Science: Chemistry from Ain Shams University, Egypt in 1997.

**Courses**

Dr. Mamdouh teaches a wide range of scientific curricula in the fields of general chemistry, general science and nanotechnology for undergraduate and graduate students.

**Student supervision**

Dr. Mamdouh supervised many scientific and research theses for undergraduate, masters and doctoral students at AUC, and also in co-supervision with national universities such as faculties of science, pharmacy, dentistry and agriculture at Cairo and Ain Shams Universities as well as the Egyptian Atomic Energy Authority.

In addition, the research team headed by Dr. Mamdouh is considered the most diverse in the field of nanotechnology globally, as it includes a distinguished group of students and researchers in different backgrounds in the fields of chemistry, biology, biotechnology, mechanical engineering, dentistry and pharmacy.

Around 40 students (undergraduate, M.Sc. and Ph.D.) graduated under Mamdouh’s supervision since 2014, which is one of the highest records. Many of those students further developed their careers abroad (PhD studies) in USA, UK, Switzerland, Germany and France.

**International collaboration**

Dr Mamdouh has a number of joint scientific cooperation with the most prestigious European, American and Asian universities in the fields of cancer, antimicrobial systems and Food packaging.

**Research interests**

The current scientific research of the research team led by Dr. Mamdouh is focused on: (a) Developing integrated polymeric compounds, nanoparticles and fibers with unique properties, studying their different properties, and using them as highly accurate drug nanocarriers in the field of various diseases and nano cosmetics, (b) developing antibacterial nano-wound dressings, (c) bone/tissue growth engineering, (d) developing membranes designed in ways that allow the degree of porosity and filtration to be controlled and used in biomedical, filtration and packaging applications.

For more than 20 years, Dr. Mamdouh has built up significant research experience in the field of nanoscience and nanotechnology where he was engaged in performing state-of-the-art nanoscience and nanotechnology research in a multidisciplinary research environment across many scientific fields such as chemistry, physics, biology, material science, and surface science.

Dr. Mamdouh used in his research a wide variety of nanomaterials ranging from core-shell silver nanoparticles, nanofibers, DNA/RNA nucleobase molecules, modified nucleobases, peptide nucleic acids, locked nucleic acids, amino acids, carbon nanotubes, enzymes, proteins, chromosomes, and DNA origami.

Dr. Mamdouh’s research work is divided into four main parts:

1. Designing novel nanomaterials and nanocomposites - electrospun nanofibers and conjugated nanoparticles - for biomedical, industrial and packaging applications using natural and synthetic polymers, herbal extracts and essential oils.
2. Investigating different biomedical activities (such as antibacterial, drug delivery, antioxidant, and cell proliferation) of the developed nanomaterials
3. Applications of the prepared nanomaterials in
* Drug delivery (for cancers like breast and lung) and neurodegenerative diseases (Alzehimer)
* Antibacterial and antifungal nano-coatings
* Nanofibers scaffolds for wound dressings
* Nanofibers scaffolds for tissue engineering (including bone, cartridge, tissue and skin regeneration), and Nanodentistry
* Nanofibers scaffolds for Nano-cosmetics,
* Nanoporous membranes for biomedical, industrial and packaging applications.
* Converting food waste into useful nanomaterials in different forms (nanofibers and nanoparticles), with enhanced biomedical applications
1. Instruments development: Dr. Mamdouh is interested in building scientific instruments such as Electrospinning techniques which are cost-effective, reliable, robust and user friendly, in addition to biomedical kits

**Founder of a Startup**

Dr. Mamdouh is the CEO and Founder of a recent Spinoff Company (NANOFibTECH) for producing innovative nanotechnology-based antibacterial and disinfectant liquids and skincare solutions for healthcare industry – From the lab to the market. The project led to this startup was initially funded by AUC followed by series of funding received from the Academy of Scientific Research & Technology (ASRT) in Egypt. NANOFiBTECH was incubated in collaboration with Bedaya Center for Entrepreneurship & SMEs Development (GAFI), Ministry of Investments in Egypt for 9 months in 2016 through National Incubation program (INTILAQ). Following that, NANOFiBTECH won the first place prize among 200 participants for the best startup in the 3rd Cairo International Exhibition of Innovation (Cairo Innovates 2016), organized by ASRT in Egypt. At the beginning of the COVID-19 pandemic, in 2020 Dr. Mamdouh won another national competition “Ideation Fund” and received funding for developing novel eco-friendly disinfectants against COVID-19 from ASRT. In 2020-2021, NANOFiBTECH won the prestigious NINJA business plan competition organized by the Japanese Agency of International Cooperation Egypt Office (JICA) as a promising emerging startup in Egypt, that not only provide prescriptive solutions to the current Pandemic but also respond to the expected radical changes in post-Pandemic socio-economic reality.

**Publications**

Dr. Mamdouh published around 65 papers in international peer-reviewed journals such as Nature, Nature Nanotechnology, Scientific Reports, International Journal of Pharmaceutics, ACS NANO, Journal of the American Chemical Society, Journal of Physical Chemistry and many more, in addition to two book reviews and conference proceedings and his publications received more than 4000 citations worldwide. Mamdouh’s work has been presented at many different universities and specialized conferences where he has been invited to lecture and chair sessions at many national, international conferences, workshops and universities in Europe, China, United States and Egypt.

**Selected publications**

[1] Wisam Khalaf Delan, Isra Ali, Mai Zakaria, Basma Elsaadany, Ahmed R. Fares, Aliaa N. ElMeshad, Wael Mamdouh\*. *Investigating the bone regeneration activity of PVA nanofibers scaffolds loaded with simvastatin/chitosan nanoparticles in an induced bone defect rabbit model.* International Journal of Biological Macromolecules 222, 2399-2413

[2] Ahmed Emadelddin Mohamed, Amro Shetta, James Kegere, Wael Mamdouh\*. *Antibacterial and antioxidant properties of Cichorium intybus extract embedded in a chitosan nanocomposite nanofibers*. International Journal of Biological Macromolecules, 2022, 215, 387-397

[3] Nourihan S. Farrag, Hanan A. El-Sabagh, Abdulaziz M. Al-mahallawi, Wael Mamdouh\*, Abeer M. Amin, Ahmed Abd El-Bary. *“Improvement of doxorubicin radioiodination and in-vivo cancer suppression via loading in nanosilver system”.* Applied Radiation and Isotopes, 2022, 187, 110288

[4] Nouran Sharaf, Amro Shetta, Wael Mamdouh\*. *Applying Box–Behnken Design for Formulation and Optimization of PLGA-Coffee Nanoparticles and Detecting Enhanced Antioxidant and Anticancer Activities.* Polymers, 2022, 14, 144

[5] Isra H. Ali, Amgad Ouf, Fatma Elshishiny, Mehmet Berat Taskin, Jie Song, Mingdong Dong, Menglin Chen, Rania Siam, Wael Mamdouh\*. *“Antimicrobial and Wound Healing Activities of Graphene Reinforced Electrospun Chitosan/Gelatin Nanofibrous Nanocomposite Scaffolds”.* ACS Omega, 2022, 6, 1838-1850

[6] Khadiga M. Sadek, Wael Mamdouh\*, Shaymaa I. Habib, Mervat El Deftar, A. Nour A. Habib. *“Evaluation of Cell proliferation of an Experimentally Fabricated Polymer Scaffold with and without Punica granatum for Bone Regeneration: An in-vitro Study”*. ACS Omega, 2021, 6, 34447−34459

[7] Sandra Sherif Amer, Maha Nasr, Amr El Shaer, Elena Polycarpou, Rasha T.A. Abdel-Aziz, Omaima A. Sammour, Wael Mamdouh\*. *“Quercetin loaded cosm-nutraceutical electrospun composite nanofibers for acne alleviation: Preparation, characterization and experimental clinical appraisal*”. International journal of Pharmaceutics, 2022, 612, 121309

[8] Raneem Jatal, Rihab Osman, Wael Mamdouh, Gehanne Awad\*. “*Lung targeted electrosprayed chitosan nanocomposite microparticles boost the cytotoxic activity of magnolol”*. Carbohydrate Polymers Technologies and Applications 2021 (Published online)

[9] Wisam Khalaf Delan, Basma Elsaadany, Ahmed R. Fares, Aliaa N. ElMeshad, Wael Mamdouh, and Mai Zakaria\*. *“Histomorphometric analysis of bone formation after using simvastatin chitosan nanoparticles as a local delivery system in periodontal bony defects in rabbits”.* Advanced Dental Journal, 2021, 3 (3), 109-120

[10] Elkhouly, Hend, Mamdouh\*, Wael, Elkorashy, Dalia. “*Electrospun nano-fibrous bilayer scaffold prepared from polycaprolactone/gelatin and bioactive glass for bone tissue engineering*”. Journal of Materials Science: Materials in Medicine Vol 32, (July 2021), 111, pp. 1-15.

[11] Farrag, Nourihan S., Shetta, Amro, Mamdouh\*, Wael. “*Green tea essential oil encapsulated chitosan nanoparticles-based radiopharmaceutical as a new trend for solid tumor theranosis”.*

International Journal of Biological Macromolecules, Vol 186, (July 2021), pp. 811-819.

[12] Helmi, Omar, Elshishiny, Fatma and Mamdouh\*, Wael. *“Targeted Doxorubicin delivery and release within breast cancer environment using PEGylated chitosan nanoparticles labeled with monoclonal antibodies”.* International Journal of Biological Macromolecules, Vol. 184 (2021), pp. 325–338.

[13] Hetta, Alia A. F., Attallaha, Olivia A., and Mamdouh,\* Wael. *“Quality Evaluation of Oil Recovered from Euthynnus affinis (Kawakawa) fish Using Ecofriendly Chitosan/Oil –Non Centrifuged Sequential Purification technique”*. Journal of Food Processing and Preservation, Vol 45 (1), e15099, (Jan. 2021), pp. 1-11.

[14] Attallaha, Olivia A., and Mamdouh, \* Wael. *“Development and optimization of Pectin/Chitosan magnetic sponge for efficient cationic dyes removal using Box-Behnken design”*. International Journal of Environmental Science and Technology, Vol 18, No. 3, (Jan. 2021), pp. 131-140.

[15] Omar, Sara H., Osman, Rihab,⁎ Mamdouh, Wael, Abdel-Bar, Hend M., Awad, Gehanne A.S. “*Bioinspired lipid-polysaccharide modified hybrid nanoparticles as a brain targeted highly loaded carrier for a hydrophilic drug”.* International Journal of Biological Macromolecules, Vol 165, (Sept. 2020), pp. 483 – 494.

[16] Attallaha, Olivia A., Shetta, Amro, Elshishiny, Fatma, and Mamdouh,\* Wael. “*Essential Oil Loaded Pectin/Chitosan Nanoparticles Preparation and Optimization via Box–Behnken Design against MCF-7 Breast Cancer Cell Lines”*. RSC Advances, Vol 10, No. 15, (Feb. 2020), pp. 8703-8708.

[17] Amer, Sandra S., Nasr\*, Maha,⁎ Abdel-Aziz, Rasha T.A., Moftah, Noha H., El Shaer, Amr, Polycarpou, Elena, Mamdouh, Wael, Sammour, Omaima. “*Cosm-nutraceutical nanovesicles for acne treatment: Physicochemical characterization and exploratory clinical experimentation”.*

International Journal of Pharmaceutics, Vol 577, (Jan. 2020), pp. 119092.

[18] Elshishiny, Fatma and Mamdouh,\* Wael. *“Fabrication of Nanofibrous/Xerogel Layer-by-Layer Biocomposite Scaffolds for Skin Tissue Regeneration: In-Vitro Study”*. ACS Omega, Vol 5, No. 5, (Jan. 2020), pp. 2133-2147.

[19] Wahbi, Walaa, Kegere, James, Elmehelmy, Worood, Siam, Rania, Mamdouh,\*Wael. *“Novel Inulin Electrospun Composite Nanofibers: Prebiotic and Antibacterial Activities”.*

ACS Omega, Vol 5, No. 6, (Feb. 2020), pp. 3006-3015.

[20] Delan, Wisam K., Zakaria, Mai, Elsaadany, Basma, ElMeshad, Aliaa N., Mamdouh, Wael, Fares, Ahmed R.. *“Formulation of simvastatin chitosan nanoparticles for controlled delivery in bone regeneration: Optimization using Box-Behnken design, stability and in-vivo study”*.

International Journal of Pharmaceutics Vol 577 (Jan. 2020), pp. 119038.

[21] Shendy, Amr H., Eltanany, Basma M., Al-Ghobashy,\* Medhat A., Gadalla, Sohair A. Mamdouh, Wael, Lotfy, Hayam M. “*Coupling of GC-MS/MS to Principal Component Analysis for Assessment of Matrix Effect: Efficient Determination of Ultra-Low Levels of Pesticide Residues in Some Functional Foods”*. Food Analytical Methods (Oct. 2019) Vol12, pp.2870–2885.

[22] Kegere, James, Ouf, Amged, Siam, Rania, Mamdouh\* Wael. *“Fabrication of Poly(vinyl alcohol)/Chitosan/Bidens pilosa Composite Electrospun Nanofibers with Enhanced Antibacterial Activities”.* ACS Omega, Vol 4, (May 2019), pp.8778-8785.

[23] Shetta, Amro, Kegere, James, Mamdouh⁎ Wael. *“Comparative study of encapsulated peppermint and green tea essential oils in chitosan nanoparticles: Encapsulation, thermal stability, in-vitro release, antioxidant and antibacterial activities”*. International Journal of Biological Macromolecules, Volume 126, (Jan. 2019), pp. 731-742.

[24] Amer, S. Sandra; Nasr, Maha \*, Mamdouh, Wael, Sammour, Omaima. “*Insights on the use of nanocarriers for acne alleviation*”. Current Drug Delivery. Vol 16 No. 1(Jan. 2019), pp. 18-25.

[25] Fahmy,Sherif, Mamdouh, \*Wael. “*Garlic Oil - loaded PLGA Nanoparticles with Controllable Size and Shape and Enhanced Antibacterial Activities”*. Journal of Applied Polymer Science, Vol 135, No. 16, 46133 (Jan. 2018), pp. 1-9.

[26] Farrag, S. Nourihan, El-Sabagh, A. Hanan, Al-mahallawi, M. Abdulaziz, Amin, M. Abeer, AbdEl-Bary, Ahmed, Mamdouh,\* Wael*.“Comparative Study on Radiolabeling and Biodistribution of Core-Shell Silver/Polymeric Nanoparticles-Based Theranostics for Tumor Targeting”*. International Journal of Pharmaceutics*,* Vol.529**,** (June 2017), pp.123-133.

[27] ElBaz, M. Nancy, Ziko, Laila, Siam, Rania, Mamdouh,\* Wael. *“Core-Shell Silver/Polymeric Nanoparticles-Based Combinatorial Therapy against Breast Cancer In-vitro*”.

Scientific Reports (Nature Publishing Group), Vol. 6, No. 30729, (Aug. 2016), pp.1-9.

[28] Fahim, S. Irene, Mamdouh, Wael, Salem, G. Hanadi. “*Effect of Processing Technique on LDPE Thin Films and sheets”.* International Journal of Engineering Inventions, Vol. 4, No. 12, (Aug. 2015), pp. 01-05.

[29] Fahim, S. Irene, Mamdouh, Wael, Salem, G. Hanadi. “*Chitosan Nanocomposite Mesoporous Membranes: Mechanical and Barrier Properties as a Function of Temperature”*.

Journal of Materials Science Research, Vol. 4, No. 4, (June 2015), pp.1-18.

[30] Fahim, S. Irene, Marei, Narguess, Salem, G. Hanadi, Mamdouh, Wael. *“Effect of Graphene and Fullerene Nanofillers on Controlling the Pore size and Physicochemical Properties of Chitosan Nanocomposite Mesoporous Membranes*”. Journal of Nanomaterials, Vol. 25. (Jan. 2015), pp. 1-10.

[31] Lin, Lin, Cui, Haiying, He, Ronghai, Liu, Lei, Zhou, Cunshan, Mamdouh, Wael, Ma, Haile.“*Effect of Ultrasonic Treatment on the Morphology of Casein Particles”.* Ultrasonics Sonochemistry, Vol. 21, No. 2, (March 2014), pp. 513–519.

[32] Lin, Lin, Cuia, Haiying, Vittayapadung, Saritporn, Xiao, Zhihong, Wu, Wenyu, Zhang, Aihua, Mamdouh, Wael, Li, Changzhu. *“Synthesis of Recyclable Hollow Fe/C-SO3H Fiber as a Catalyst for the Production of Biodiesel”*. Environmental Progress & Sustainable Energy, Vol. 33, No. 4, (Dec. 2014), pp. 1432-1437.

[33] Fahim, S. Irene, Mamdouh,\* Wael, Salem, G. Hanadi. “*A Nanoscale Investigation of Mechanical, Thermal Stability and Electrical Conductivity Properties of Reinforced Thermoplastic Polyurethane/Graphene Nanocomposites”.* American Journal of Nanoscience and Nanotechnology, Vol. 1, No. 1, (June 2013), pp. 31-40.

[34] Madkour, M.Tarek, Hagag,M. Fatma, Mamdouh, Wael, Azzam A. Rasha. “*Molecular-level modeling and experimental investigation into the high performance nature and low hysteresis of thermoplastic polyurethane/multi-walled carbon nanotube nanocomposites*”. Polymer, Vol. 53, (Oct. 2012), pp. 5788-5797.

[35] Mamdouh, Wael,\* Li, Yingzhi, M. Shawky, Sherif, M. E. Azzazy, Hassan, Liu, Chang-jun. *“The Influence of “Glow Discharge Plasma” as an External Stimulus on the Self-Assembly, Morphology and Binding Affinity of Gold Nanoparticles - Streptavidin Conjugates”*. International Journal of Molecular Sciences, Vol. 13, (May 2012), pp. 6534-6547.

[36] Li, Yinli, Zhang, Shuai, Guo, Lijun, Dong, Mingdong, Liu, Bo, Mamdouh, Wael. *“Collagen coated tantalum substrate for cell proliferation”*. Colloids and Surfaces B: Biointerfaces, Vol. 95, (Jan. 2012), pp. 1-15.

**Patents**

Dr. Mamdouh recently registered several patent applications in the United States of America, related to: (a) the development of conjugated nanoparticles and compounds (Nanoparticle-based Combinatorial Therapy) for the treatment of breast cancer. (b) Nanofibers for Antibacterial and Prebiotic applications for the development of antibacterial nano-wound dressings that help treat colon and digestive disorder problems at the same time. (c) Manufacture of medical disinfectants made of nanocapsules made of natural materials and essential oils with a superior ability to prevent the accumulation of bacteria and germs on different surfaces.