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Editorial

Crystalline Micro- and Nano-Materials for Medical and Other Biochemical Applications

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The Special Issue on "Crystalline Micro- and Nano-Materials for Medical and Other Biochemical Applications" is a collection of seven original articles (including three research papers and four review papers) dedicated to theoretical and experimental research work that provides new insights and practical findings in the field of crystal-related biomedicine.

The use of crystalline micro- and nano-materials, based on organic and inorganic molecules, is a rapidly progressing field of medical and biochemical applications. Particular focus is given to solids with functional biochemical properties, which can be used in medical, pharmaceutical, environmental, microbial, energy, and many other biochemical applications. Although the synthesis of crystalline micro- and nano-materials has been largely carried out in recent years, the applications of these materials still face problems in different fields in practice.

On the topic of crystalline micro- and nano-materials for medical and biochemical applications, it is important to focus more on the application aspect of these materials in the near future, to aid the development of this discipline. First of all, the fundamental theories of the synthesis methods need to be revealed to control the crystallization process and other engineering aspects. Studies need to be performed at molecular, cellular, and higher levels with the well-designed materials, to provide access to the materials in medical and biomedical applications. In vivo and in vitro studies, and higher-level clinical studies, are required in order for these materials to be used on the market. Mathematical modeling may be performed to improve the technology. In addition, ethical research and social science studies assist the development of these crystalline micro- and nano-materials for medical and biochemical applications.

Here, we outline theoretical work in which crystalline micro- and nano-materials were evaluated for medical and biochemical applications. Xiang et al. [1] tailored an α/β ratio of pollen-like anhydrous lactose with an anti-solvent technique. The products can be used as ingredient carriers to improve the solubility of pharmaceuticals. The α/β crystalline state played an important role in the release control of the crystalline micro- and nano-materials. Guo et al. [2] coated dopamine-grafted hyaluronic acid on hyperbranched poly(β-amino esters)/DNA nano-complexes for enhanced gene delivery and biosafety. The vector has good transfection efficiency and excellent biocompatibility, and can be used for gene delivery applications. Zhong et al. [3] coated hyaluronic acid on MTX-PEI nanoparticles for targeted rheumatoid arthritis therapy. The MTX-PEI@HA NPs were a promising MTX-based nanoplatform for the treatment of RA. The two articles based on material coating studied the crystalline biomaterials and their applications.

The second group of papers reviews the current techniques for the use of crystalline micro- and nano-materials in medical and biochemical applications. In this field, Yi et al. [4] concluded the existing photocatalytic materials used to treat cancer, as well as the current challenges in the application of cancer therapy. Advanced crystalline micro- and nano-materials have been used in up-to-date biomedicines. Tan et al. [5] reported the possible

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preparation approaches of nano-cocrystals. The review work provides guidance to develop new nano-cocrystals with commercial value in the pharmaceutical industry. Liu et al. [6] concluded the common reactive oxygen species (ROS) nanomaterials and reviewed the utilization of ROS in dentistry, highlighting the potential applications and safety of these materials in clinical treatment. The proposed future prospect of these materials is their use as a clinic dental cure. Li et al. [7] summarized the current studies of MALAT1 in the fibrosis of various organs. This review contributed to better understanding the molecular mechanism of fibrosis and the potential of MALAT1 as a novel therapeutic target for fibrosis. These review papers have comprehensively reported the synthesis, mechanisms, and applications of crystalline biomaterials.

I hope that this collection of papers will meet the expectations of readers looking for new advances in the field of crystalline micro- and nano-materials, as well as bringing inspirations for future research work on the medical and biochemical applications of these materials.

Conflicts of Interest: The authors declare no conflict of interest.

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