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Synthesis of nanoporous metal-organic framework based on tartrate as a new carrier for the delivery of Palbociclib drug

Mergan Haghshenas, Maryam Tohidi, and Banafsheh Rastegari

1. Synthesis of nanoporous metal-organic framework based on tartrate as a new carrier for the delivery of Palbociclib drug, merganhaghshenas@gmail.com
2. Synthesis of nanoporous metal-organic framework based on tartrate as a new carrier for the delivery of Palbociclib drug, tohidi.ma@gmail.com
3. Synthesis of nanoporous metal-organic framework based on tartrate as a new carrier for the delivery of Palbociclib drug, b.rastegari85@gmail.com

Abstract

The synthesis of biocompatible nanoporous metal-organic framework (MOF) based on tartrate was performed in the presence of protein and palbociclib (Pal) as a template for the biomineralization process and, an anticancer drug, respectively. The synthesis of MOF was completed in a single step at room temperature in aqueous media. To the best of our knowledge, this is the first report about the one-pot encapsulation of Pal in a biocompatible framework in a green solvent. This method enables high Pal loading in the framework structure (ca. 86%) at a short time of 15 min. The effect of protein concentration was investigated on the size, morphology, and crystallinity of the synthesized structures. The products were characterized with scanning electron microscopy, X-ray diffraction, Fourier transform infrared, and UV-vis spectroscopy techniques. The release rate of Pal from MOF was studied at different pH values. In vitro drug release of Pal was slower in alkaline medium (pH 7.4) compared to acidic medium (pH 5.5). The cytotoxicity of different structures was evaluated by the standard 3-(4,5 dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay on the two cell lines (NIH/3T3 (normal cell), and B16 (cancer cell)). These results suggested that the designed drug loaded MOF can have a promising effect on the treatment of cancer cells.

Key words: Bio Metal-Organic Framework (MOF), Drug delivery, Cancer, Palbociclib

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