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Biocompatible polymer-exfoliated nanosheets with ultra-high drug loading as safe and efficacious cancer therapeutics

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Abstract

Two-dimensional (2D) layered double hydroxide (LDH) nanoparticles have been widely studied for biomedical applications due to its tremendously biocompatible properties at the nanoscale. Exfoliating LDH nanoparticles into ultrathin nanosheets is an efficient way to maximize the utility of each single layer, which possess the higher specific surface area. However, current exfoliation methods of LDH nanoparticles are either time-consuming or lack of biocompatibility (bottom-up method), which remains a bottleneck for biomedical applications of LDH nanosheets. Herein, we developed a novel and rapid method to synthesis ultrathin LDH nanosheet with a thickness of around 3nm via bottom up method. In this work, the modified Poly (ethylene glycol) (PEG) is not only successfully applied as layer inhibitor to urge the formation of LDH nanosheet, but also acted as a surfactant to improve its biocompability, making this ultrathin LDH nanosheet an excellent candidature for drug delivery system. Comparted with pristine LDH nanoparticles, this nanosheets show a good colloid stability among different artificial biological solutions. It is also featured with superb drug loading capacity and loading efficiency of universal anticancer drug doxorubicin (DOX). This nanosheet loaded DOX also exhibit a pH-controlled DOX releasing manner, indicating a good tumour selectivity. Additionally, both *in vivo* and *in vitro* results reveal the excellent anticancer activity and superior biocompatibility of the DOX loaded nanosheet. overall, this work provides a potential strategy of modifying functional LDH nanosheet for its bioapplication in drug delivery system.

Biography:

He Zhang is a second year PhD candidate in the major of Chemical engineering at University of New South wales. His research maily focous on desgining 2D nanomaterilas towards efficient drug delivery system.

Speaker Publications:

1. Liu J; Guo Z; Kordanovski M; Kaltbeitzel J; Zhang H; Cao Z; Gu Z; Wich PR; Lord M; Liang K, 2020, 'Metal-organic frameworks as protective matrices for peptide therapeutics', Journal of Colloid and Interface Science, vol. 576, pp. 356 - 363, http://dx.doi.org/10.1016/j.jcis.2020.05.057.
2. Guo Z; Wang T; Rawal A; Hou J; Cao Z; Zhang H; Xu J; Gu Z; Chen V; Liang K, 2019, 'Biocatalytic self-propelled submarine-like metal-organic framework microparticles with pH-triggered buoyancy control for directional vertical motion', Materials Today, vol. 28, pp. 10 - 16, http://dx.doi.org/10.1016/j.mattod.2019.04.022.

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