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Green modified-UiO-66/MXene sandwich composites for gene chemotherapy synergistic cancer suppression: Co-delivery of doxorubicin and pCRISPR

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Advancements in material science and engineering, especially in the field of porous nanomaterials lead to new types of therapeutics and technologies. Among different types of porous nanomaterials, metal-organic frameworks (MOFs) have been considered the most promising inorganic nanomaterials due to their significant stability and ease of functionalization. To date, very limited research has been done on developing nanocomposites based on MOFs and MXenes. The current experiment has been performed to design a novel UiO-66 MOF and MXene nanocomposite, modified with *Rosmarinus officinalis* (RO) leaf extracts for co-delivery of doxorubicin (DOX)/plasmid (p)CRISPR ([1]). The synthesis procedure was completed with the assistance of a high-gravity system and a rotating packed bed (RPB) device for the first time, and the characterization results showed the successful synthesis of the nanomaterials. Based on the drug release and loading results, the DOX payload efficiency of about 46% was recorded and sustained drug release at acidic pH values (same as the cancerous cells) was observed. However, the presence of leaf extracts slowed down the drug release and have a minor effect on the release profiles, the cellular internalization results on the MCF-7 and HT-29 cell lines showed considerably dependent images. The gene transfections result by using two nanosystems of UiO-66@MXene@RO@DOX@pCRISPR, and UiO-66@MXene@RO@DOX@RO@pCRISPR showed about 18.3% and 22.1% transfection efficiency on the A549 cell lines. Those results showed not heavily dependent results on the presence or absence of the leaf extracts. Therefore, this study revealed that the green modification of nanocomposites does have a major effect only on the cellular internalizations of DOX, rather than CRISPR ([2]).

Keywords: MOF, MXene, doxorubicin, CRISPR, leaf extracts

References

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