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ZIF-8 as a potential nanocarrier for the delivery of a new 1,2,4-oxadiazole-derived drug

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Cancer is one of the leading causes of death worldwide, which is why numerous studies have been conducted on the development of nanomaterials for the targeted treatment of these diseases, such as metal-organic frameworks (MOFs). A subclass of these materials is the zeolitic imidazolate frameworks (ZIFs) that combine the interesting properties of MOFs, such as high porosity and surface area, with those of aluminosilicate zeolites, which have the same topologies[1]. The exceptional thermal and chemical stability of ZIFs overcomes two of the major issues reported in biomedical applications, making them ideal candidates for controlled drug release[2]. A class of significant biological relevance is the 1,2,4-oxadiazoles in the design of various drugs, especially chemotherapeutics[3] and ZIFs could deliver these heterocycles to cancer cells. Thus, the present work proposes the synthesis of ZIF-8 for the incorporation of a novel pro-apoptotic compound from the series of 3,5-diaryl-1,2,4-oxadiazoles for controlled cancer therapy. A new molecule was synthesized and tested in cancer cells, showing IC_{50} values of 29.11 µM for HeLa and 33.33 µM for MCF-7, indicating its potential efficacy as a therapeutic agent, as shown in Figure 1a. The synthesis of ZIF-8 nanocrystals was confirmed by XRD, TGA, FTIR and SEM analyses. Initial incorporation assays and XRD and SEM analyses confirmed the structural integrity of the loaded compound, ZIF-8@Oxa, Figure 1b and 1c. Further characterizations are being conducted to determine the porosity and surface area of this framework, as well as to simulate the release of this system in a biological environment. Moreover, these results are promising and indicate that this new system shows great potential for therapeutic use in the future.

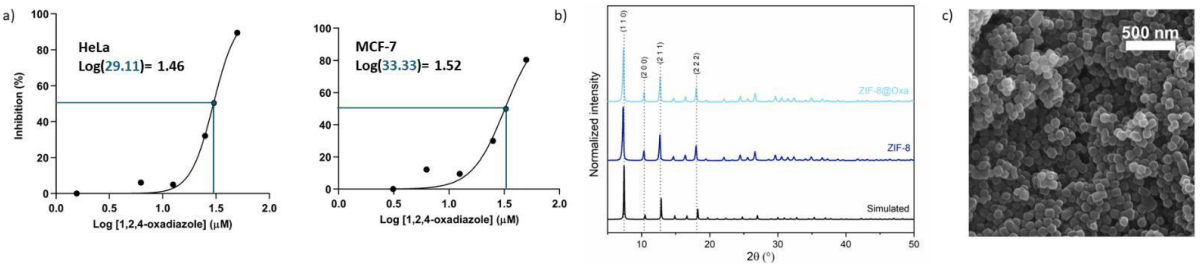

Figure 1: a) Dose-response curve of the drug concentration log for HeLa and MCF-7 cells; b) XRD analyses before and after the adsorption of oxadiazole; c) SEM analysis of the carried material (ZIF- 8@Oxa).

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