



Glutathione-Sensitive Nanocarrier Metal Organic Frameworks for the Synergistic Release of Chemotherapeutics

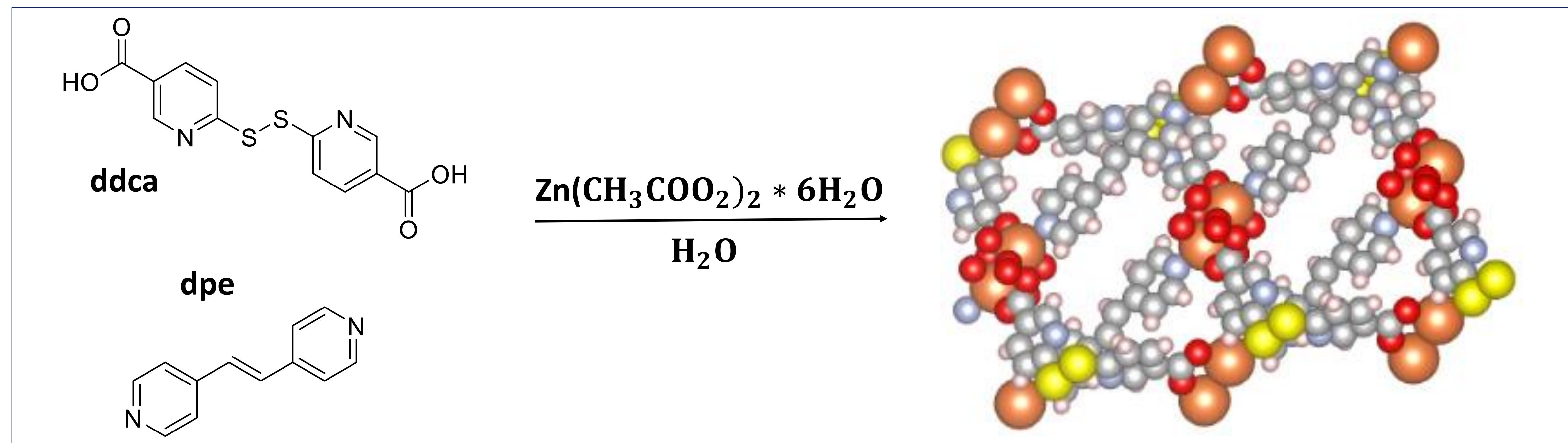
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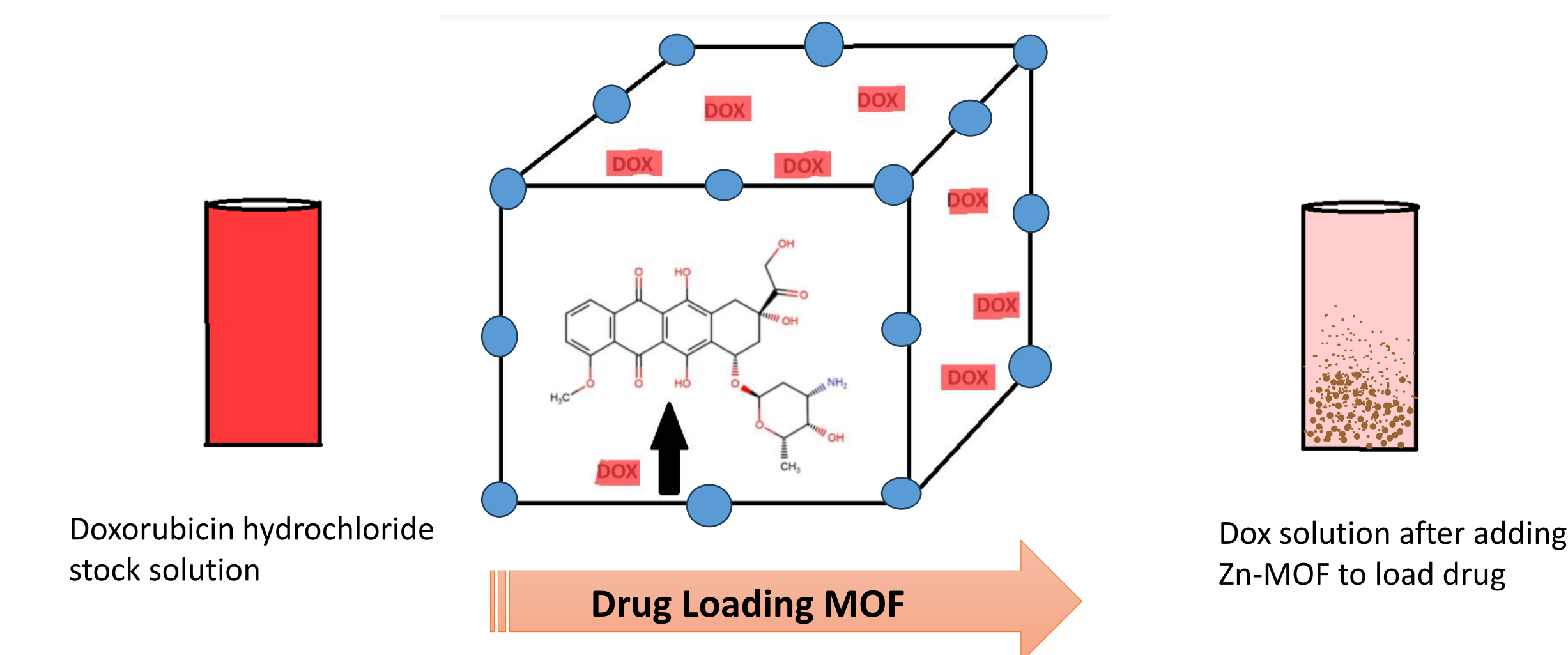
Metal Organic Frameworks (MOF)

Metal Organic Frameworks, known as MOFs are porous, crystalline structures that are made up of metal centers bonded to organic linkers. Depending on the metal ion and linker, the size of the pores and geometry of the molecule can vary greatly. These pores can absorb and encapsulate other molecules, depending on both the size of the molecule and the pores, as well as potential intermolecular interactions between the molecule and the framework. By changing the linkers, you can also alter the functionality of the MOF. This gives MOFs a wide variety of applications, such as filtration and drug delivery.

Synthesis of Zinc-based MOF: $[Zn_2(ddca)_2(dpe)]_n \cdot nH_2O$

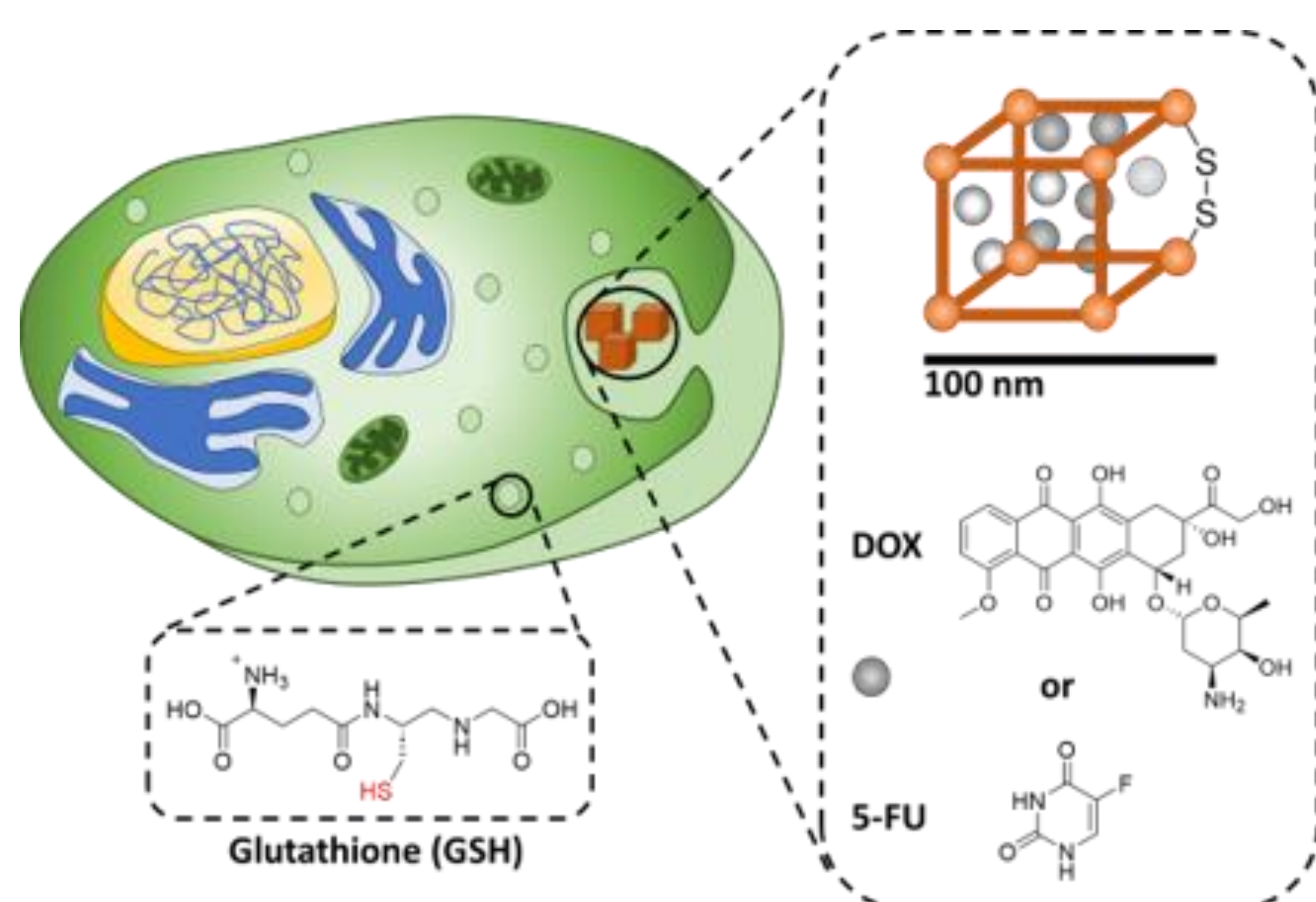


Chemotherapeutic Loading



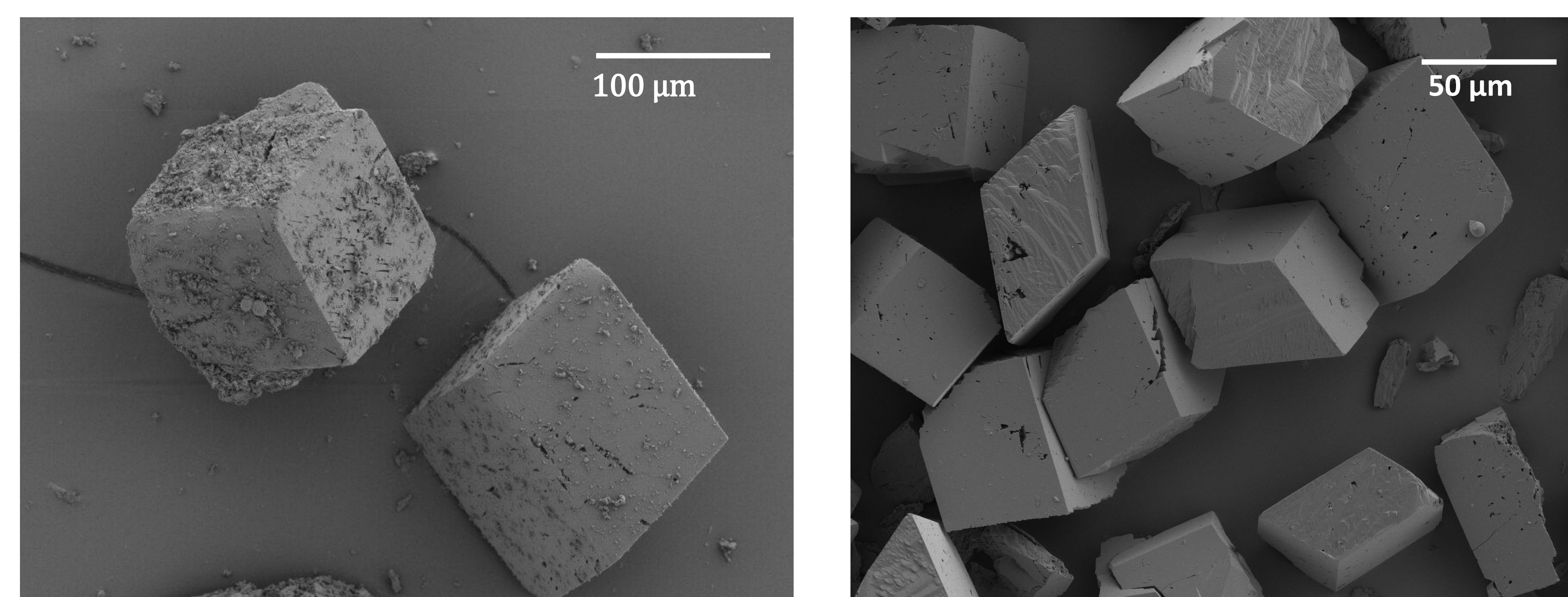
Drug Loading of Doxorubicin into $[Zn_2(ddca)_2(dpe)]_n \cdot nH_2O$; the DOX solution lightens up as the drug is loaded into MOF because of a decrease in concentration of doxorubicin in the solution

Redox-Responsive Nanoparticles

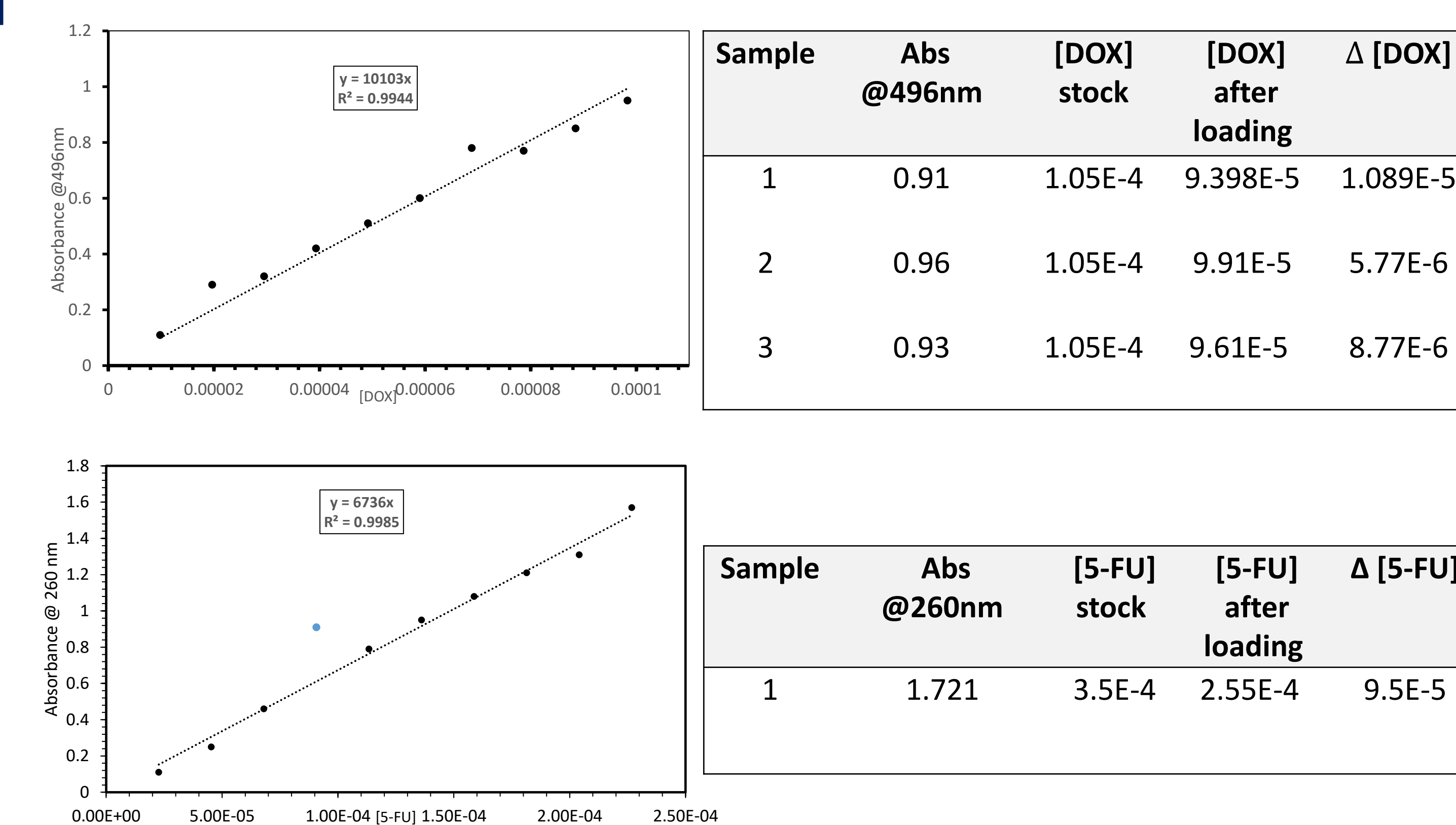


How MOF containing chemotherapeutics Doxorubicin and 5-fluorouracil is broken down inside of cells using glutathione, which is up to 1000x more present in cancer cells

SEM Images

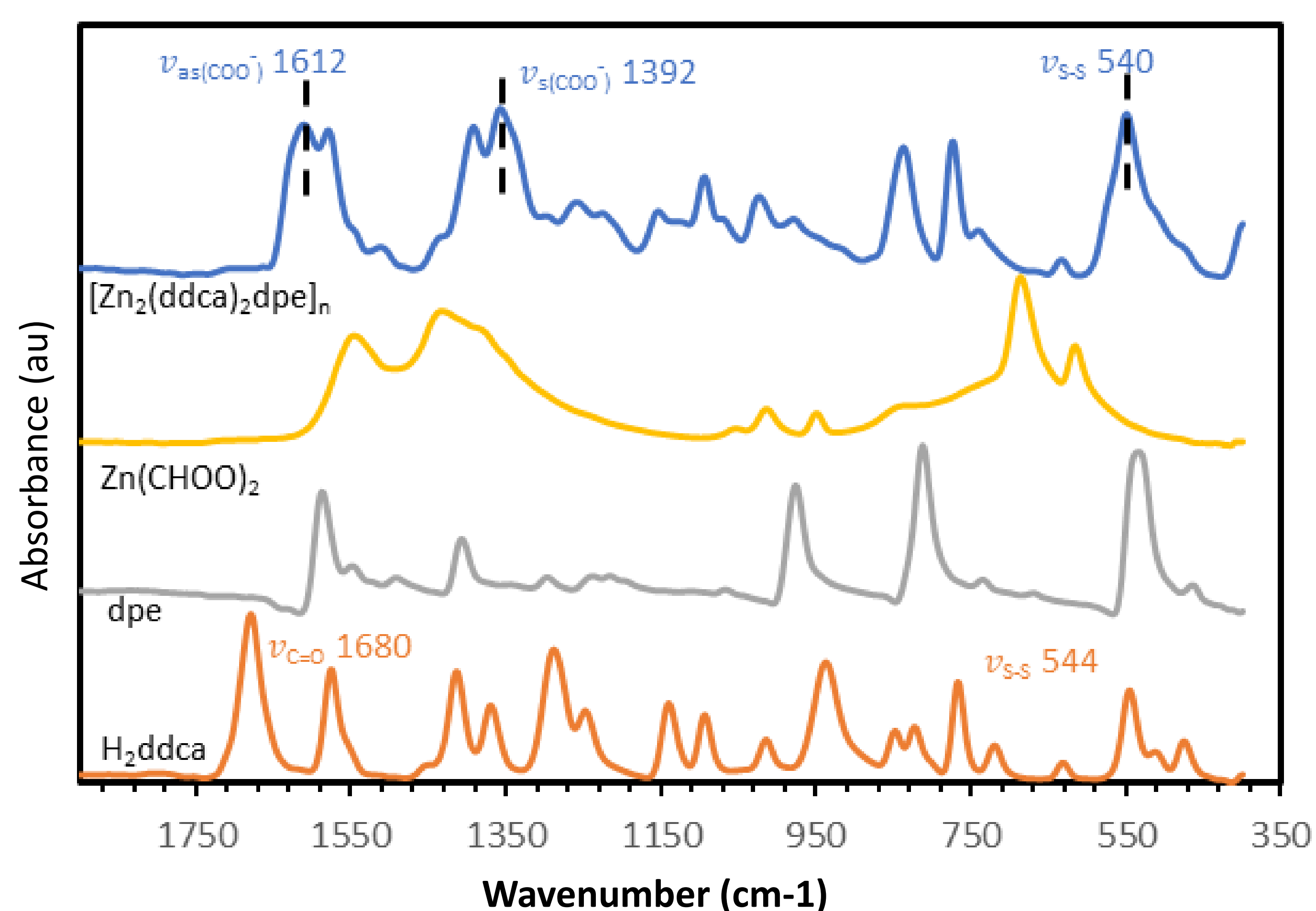


Scanning electron microscope (SEM) images of $[Zn_2(ddca)_2(dpe)]_n \cdot nH_2O$ before and after DTT degradation studies



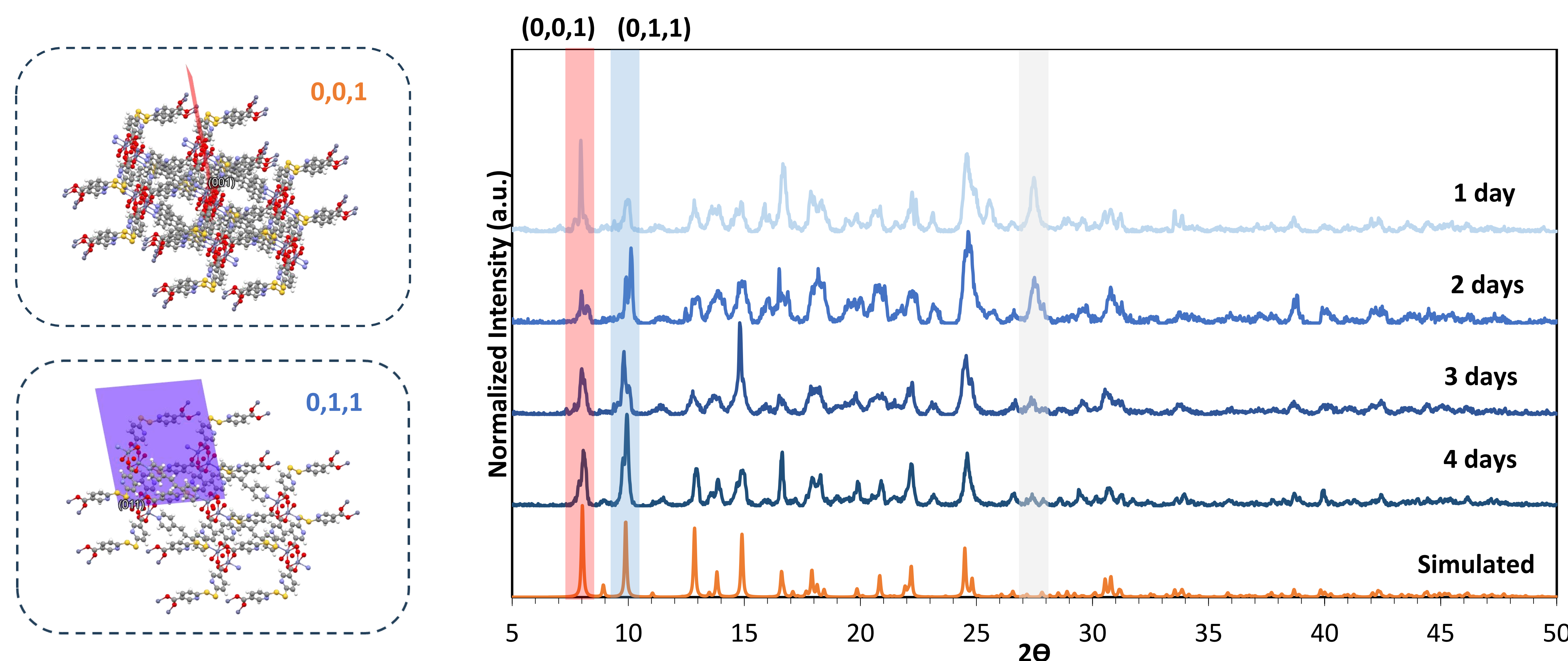
Calibration curve of doxorubicin hydrochloride and 5-fluorouracil stock solution concentration and comparing before and after concentration of stock solution with the addition of $[Zn_2(ddca)_2(dpe)]_n \cdot nH_2O$ to load pores with chemotherapeutic

IR Spectroscopy



FTIR spectra of differed reaction times showing the presence of carboxylate and disulfide in our MOF

Powder X-Ray Diffraction (PXRD)



PXRD of $[Zn_2(ddca)_2(dpe)]_n \cdot nH_2O$ showing planes in the molecule and the corresponding peak values as well as evidence of longer synthetic timing correlating to loss of starting material into product

Acknowledgements

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References

- (1) Chen, X.; Qiao, Y.; Gao, L.; Cui, H.; Zhang, M.; Lv, J.; Hou, X. Synthesis, Structure, and Characterization of Two Zn/Cd Coordination Polymers with Flexible Disulfide Carboxylate Derivatives. *Zeitschrift anorg allge chemie* **2013**, 639 (2), 403–408. <https://doi.org/10.1002/zaac.201200416>.
- (2) Kirlikovali, K. O.; Hanna, S. L.; Son, F. A.; Farha, O. K. Back to the Basics: Developing Advanced Metal–Organic Frameworks Using Fundamental Chemistry Concepts. *ACS Nanosci. Au* **2023**, 3 (1), 37–45. <https://doi.org/10.1021/acsnanoscienceau.2c00046>.