# Empowering porous silicon nanoparticles and metal-organic frameworks for solving medical problems: From cancer to heart diseases applications

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**Abstract**
Metal-organic frameworks (MOFs) hold promise as theranostic carriers for atherosclerosis.[1–4] However, to further advance their therapeutic effects with higher complexity and functionality, integrating multiple components with complex synthesis procedures are usually involved. Here, we reported a facile and general strategy to prepare multifunctional for anticancer (**Fig. 1**) and anti-atherosclerosis theranostic platform (**Fig. 2**) in a single-step manner. A custom-designed multifunctional polymer, poly(butyl methacrylate-co-methacrylic acid) branched phosphorylated β-glucan (PBMMA-PG), can effectively entrap different MOFs via coordination, simultaneously endow the MOF with enhanced stability, lesional macrophages selectivity and enhanced endosome escape. Sequential *ex situ* characterization and computational studies elaborated the potential mechanism. This facile post-synthetic modification granted the administered nanoparticles atherosclerotic tropism by targeting Dectin-1+ macrophages, enhancing in situ MR signal intensity by 72 %. Delivery of siNLRP3 effectively mitigated NLRP3 inflammasomes activation, resulting a 43 % reduction of plaque area. Overall, the current study highlights a simple and general approach for fabricating a MOF-based theranostic platform towards atherosclerosis conditioning, which may also expand to other indications targeting the lesional macrophages.

## References

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## Figures

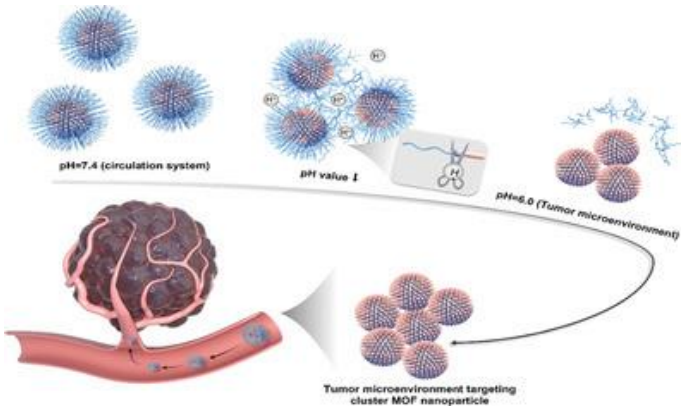


**Figure 1:** A pH-responsive metal–organic framework nanoparticle responsively removes hydrophilic compositions with steric hindrance and exposes the hydrophobic part *in situ*, forming clustering nanoparticles with enhanced tumor accumulation and therapeutic effects.

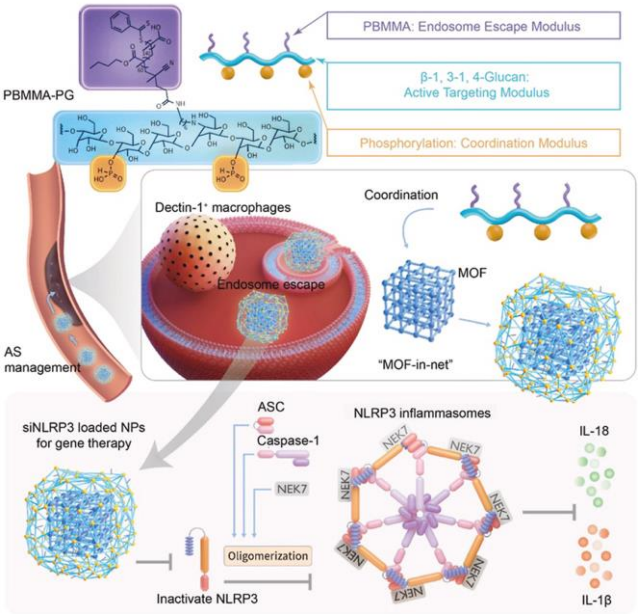


**Figure 2:** Conceptual schematic of the nanoparticle fabrication and therapeutic principle underlying its design for targeted myocardium infarction.