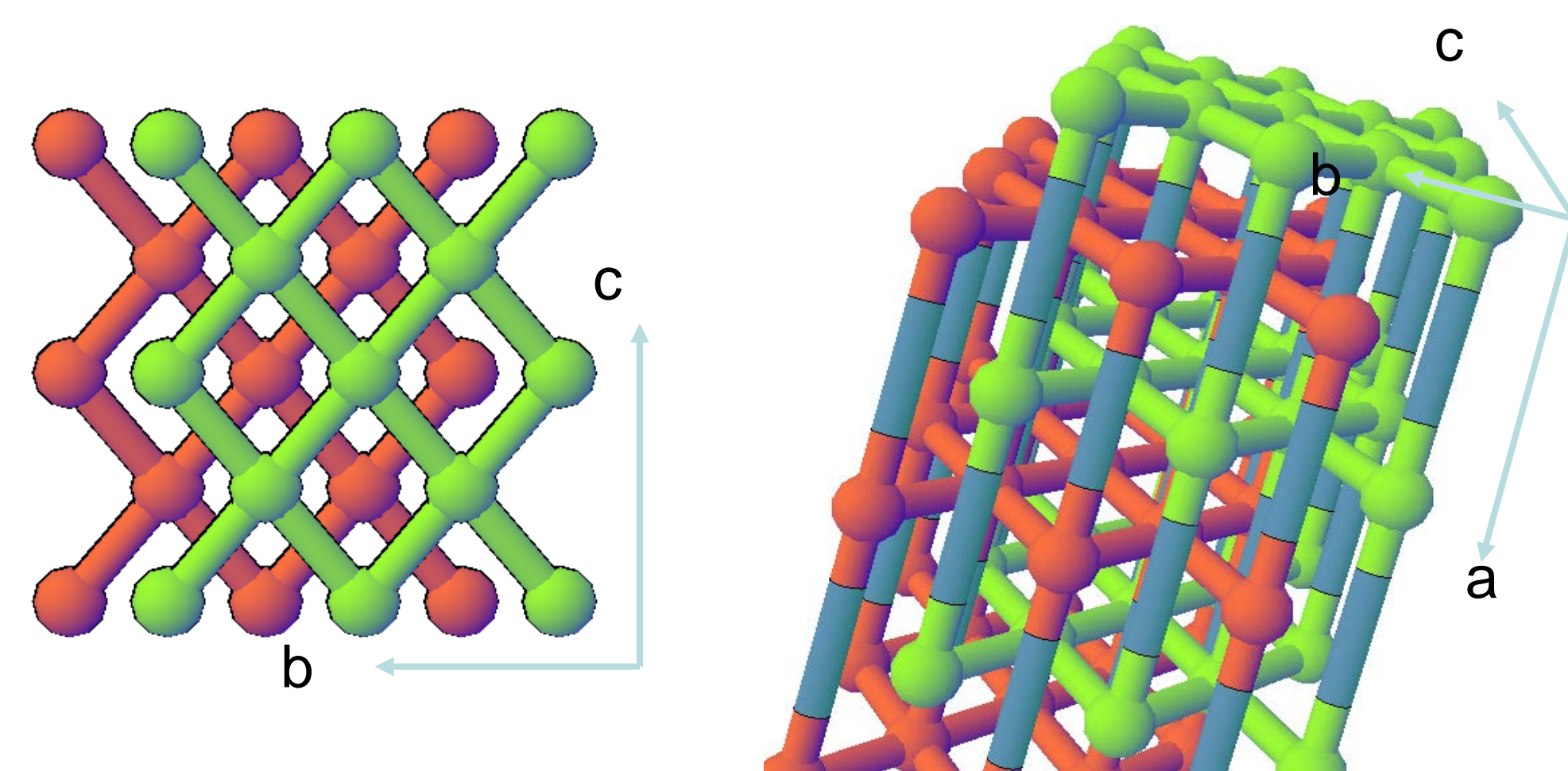


Cold welding of Metal-Organic Frameworks

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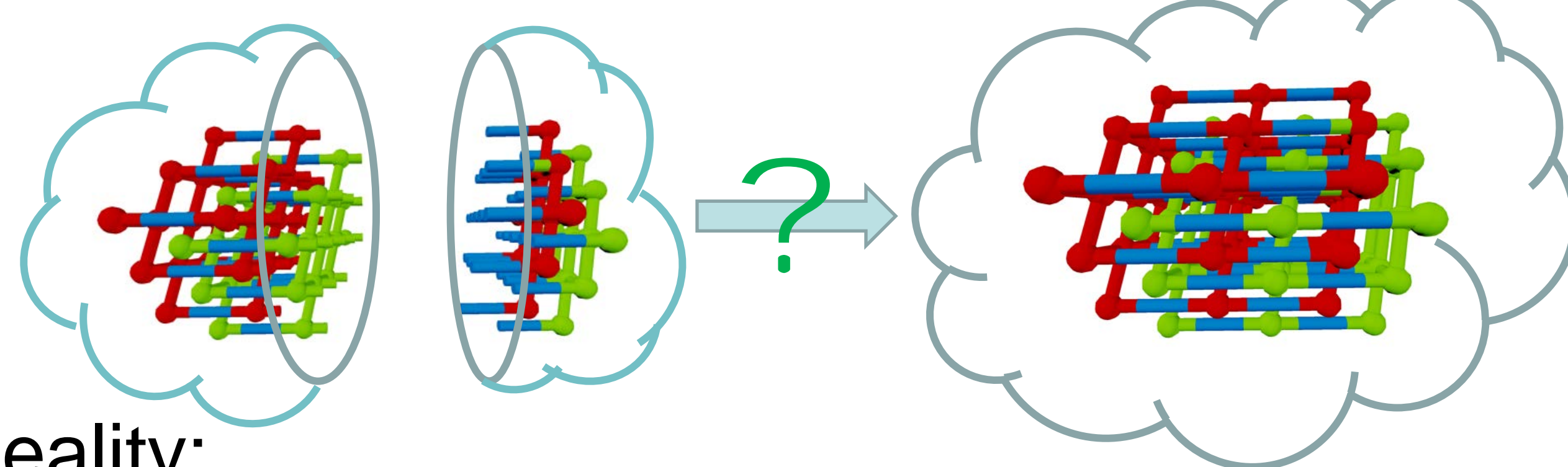
Metal-Organic Frameworks

➤ Metal Organic Frameworks (MOFs), a class of hybrid materials that combine organic ligands with metal atoms, is thought to have a bright future for various applications.

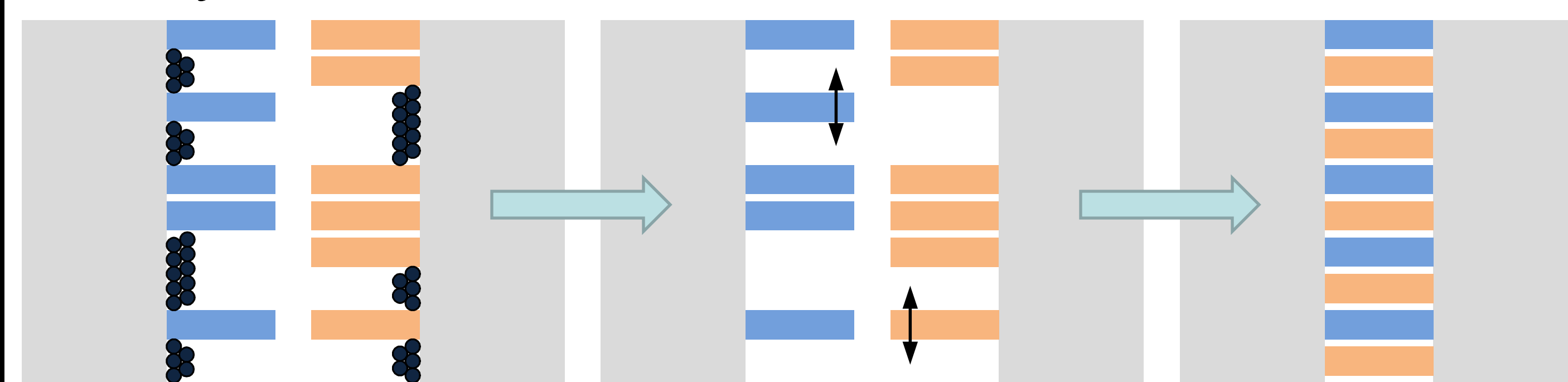


Cold welding

A Bold Idea:



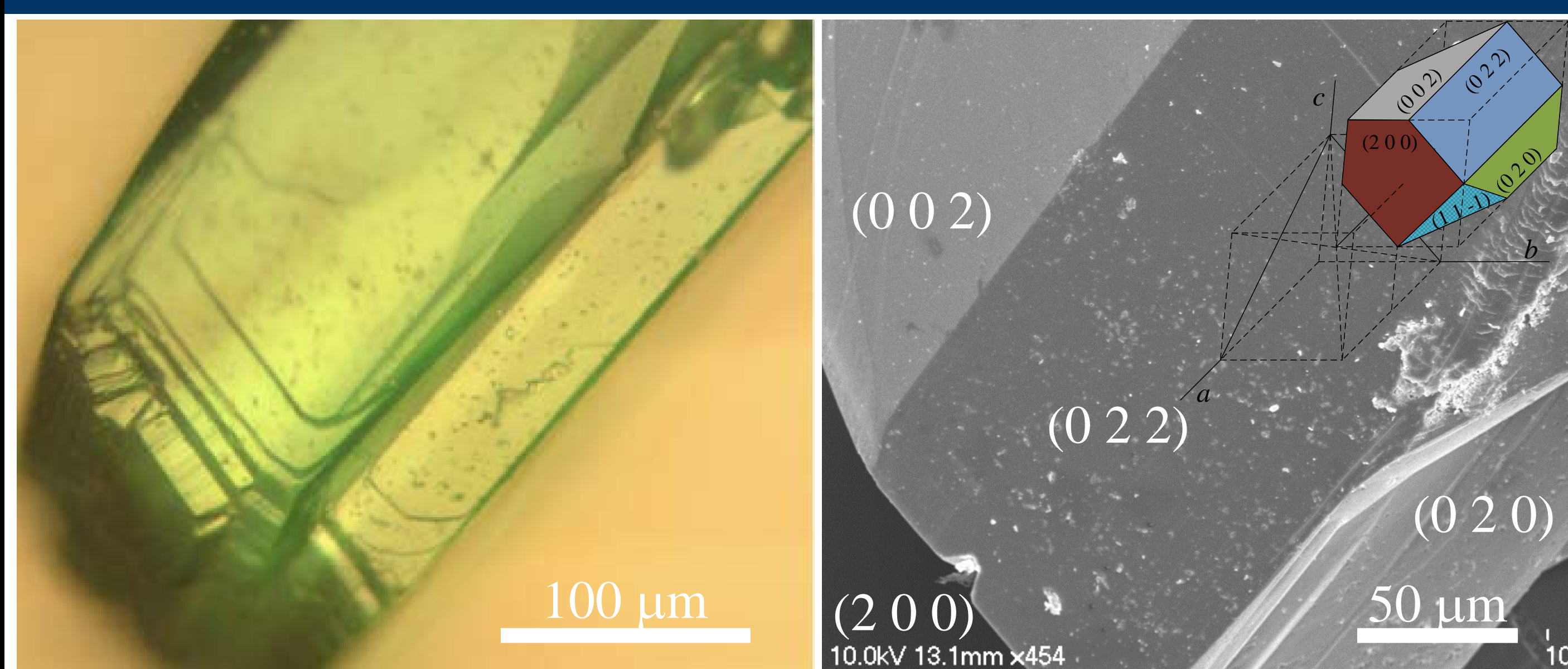
Reality:



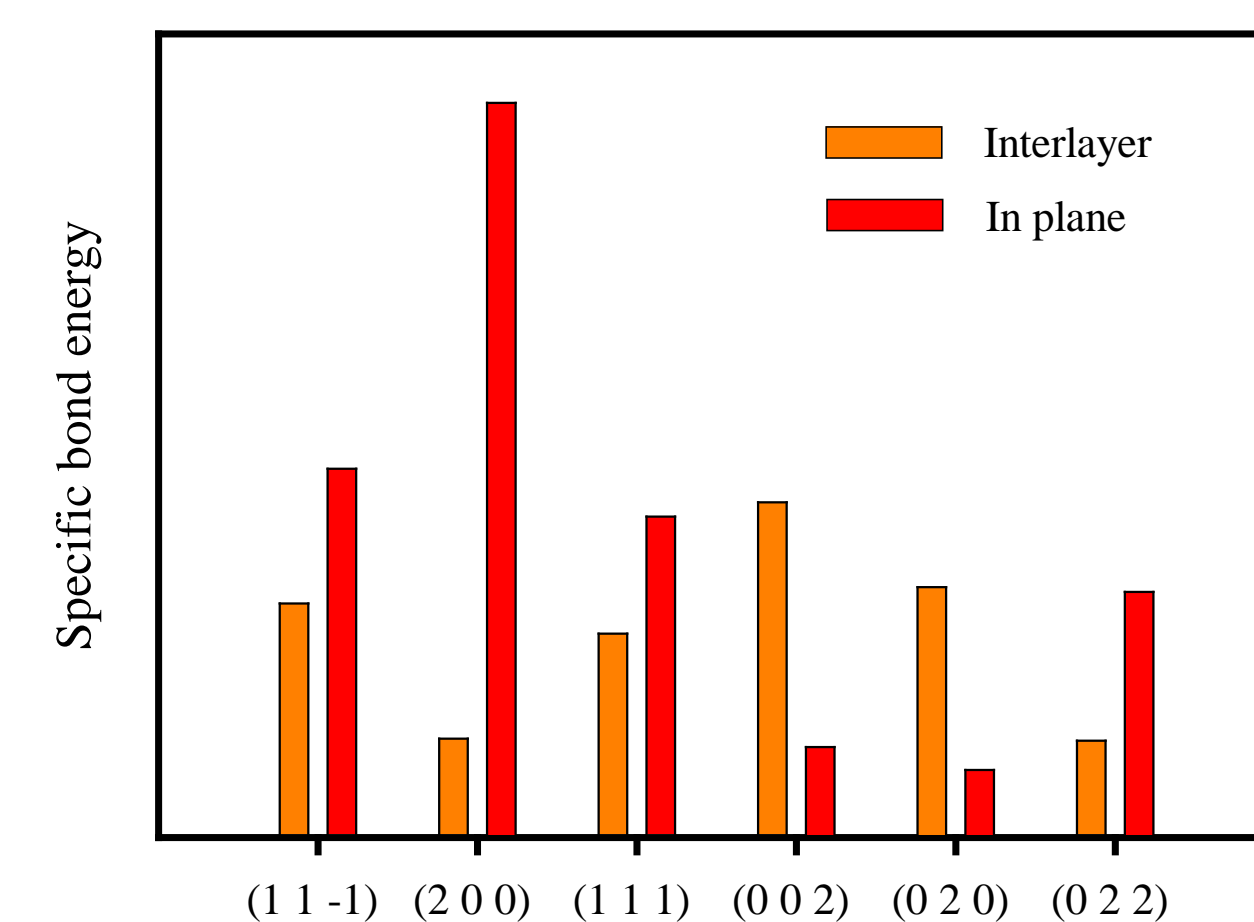
Objectives

- Understanding the heterogeneous structure of MOFs;
- Explore the possibility of cold welding (CW);
- Using cold welding to make a free-standing film;

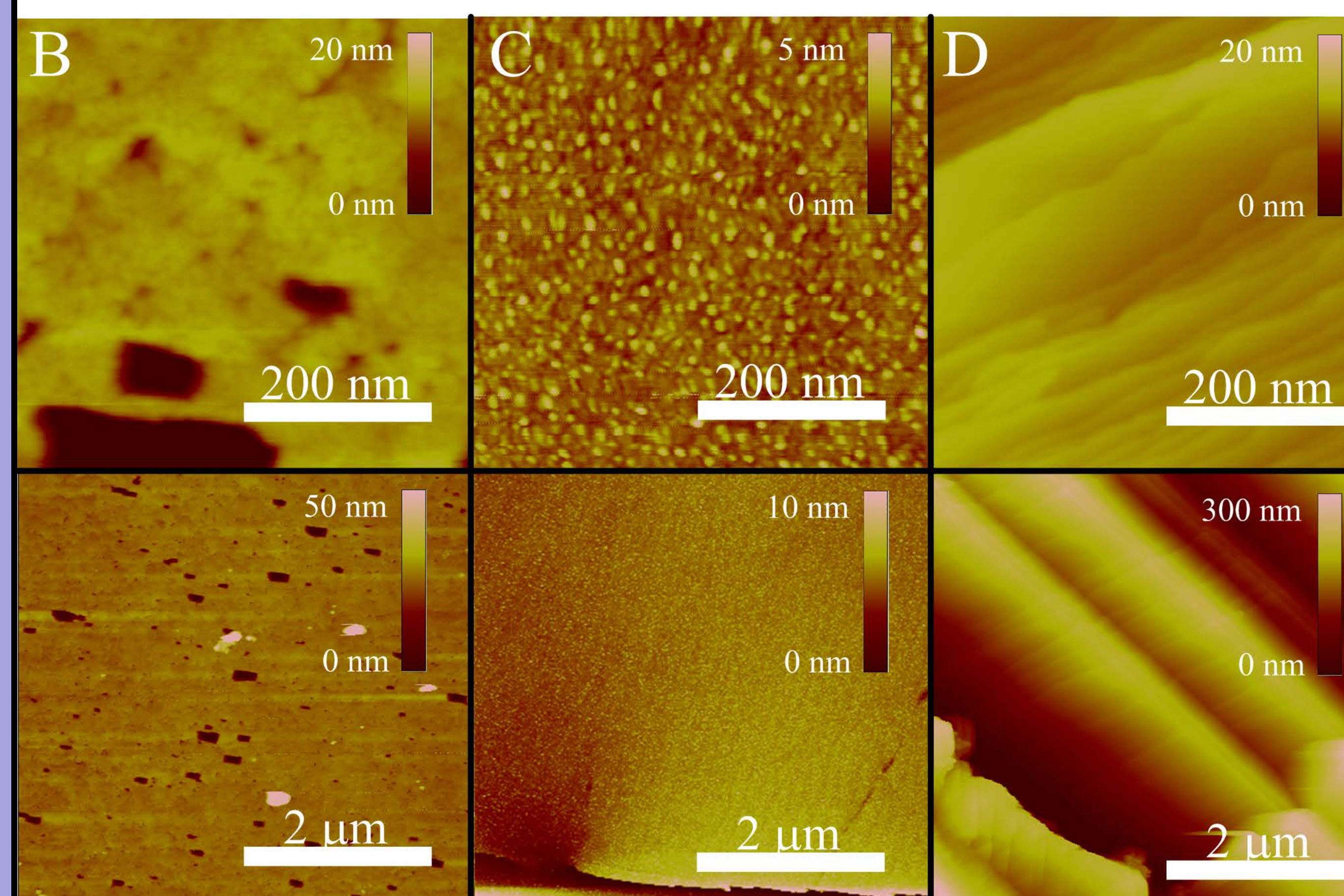
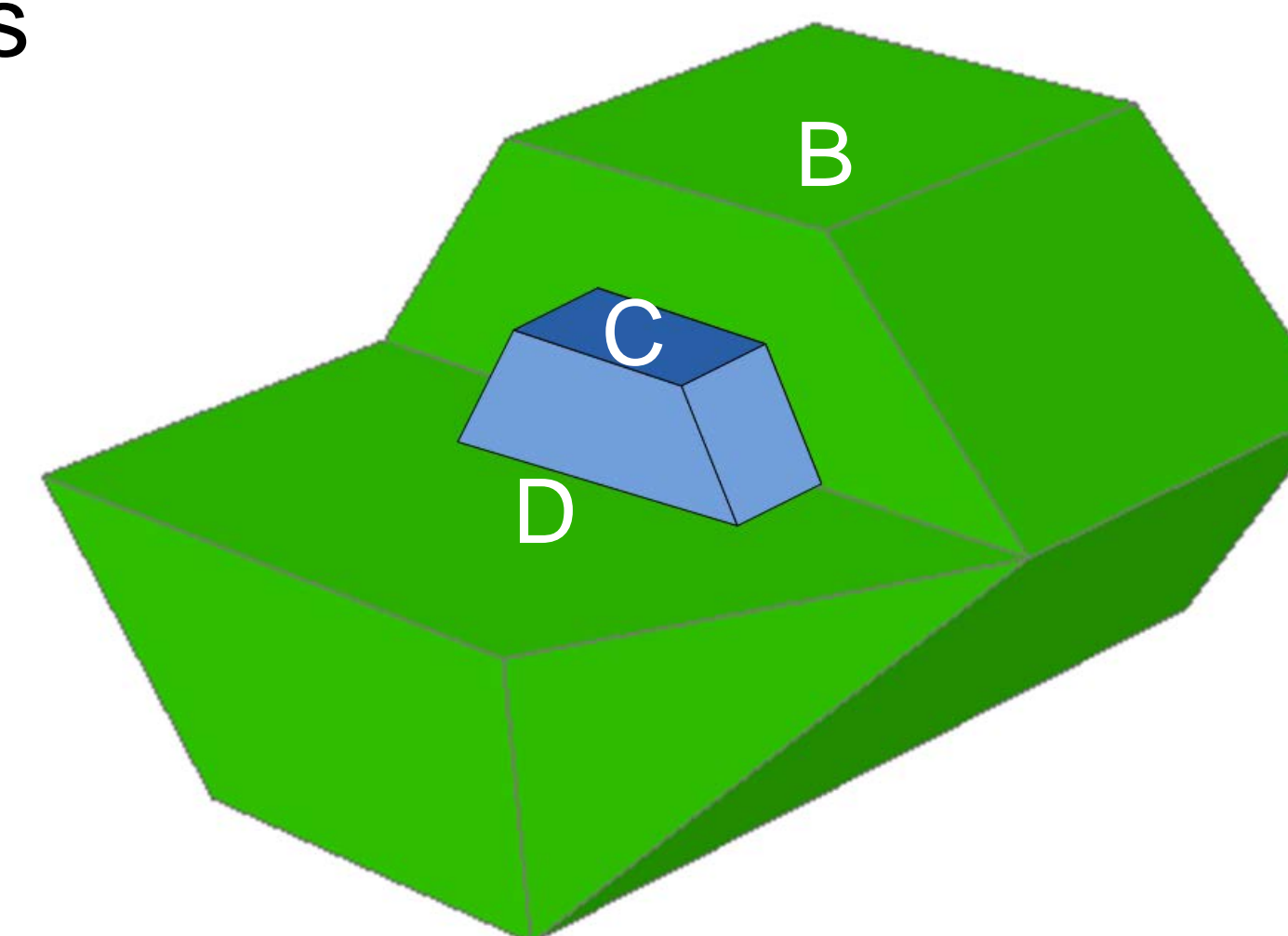
Cu-MOF



The weakest inter layer connection : (2 0 0) planes



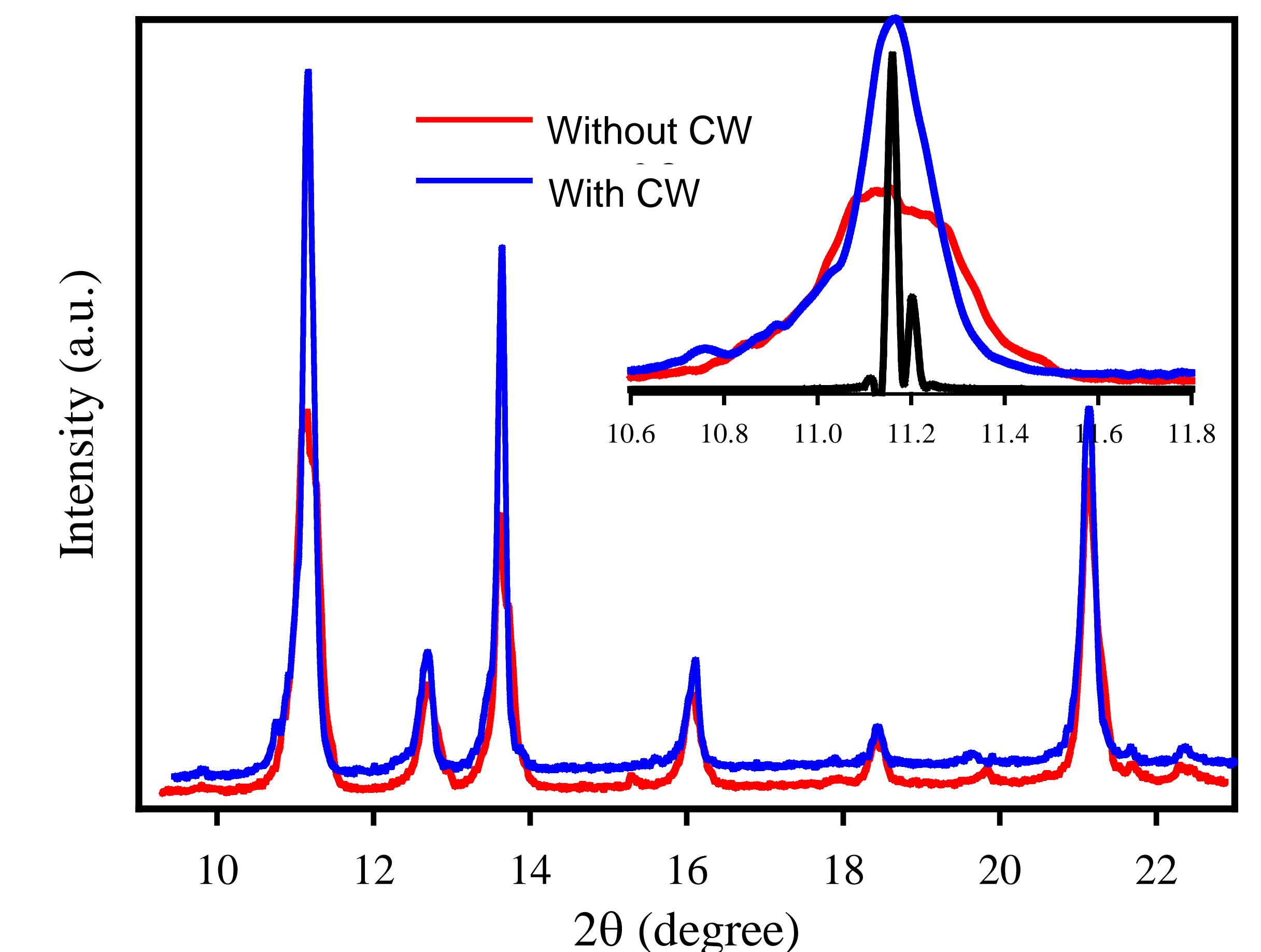
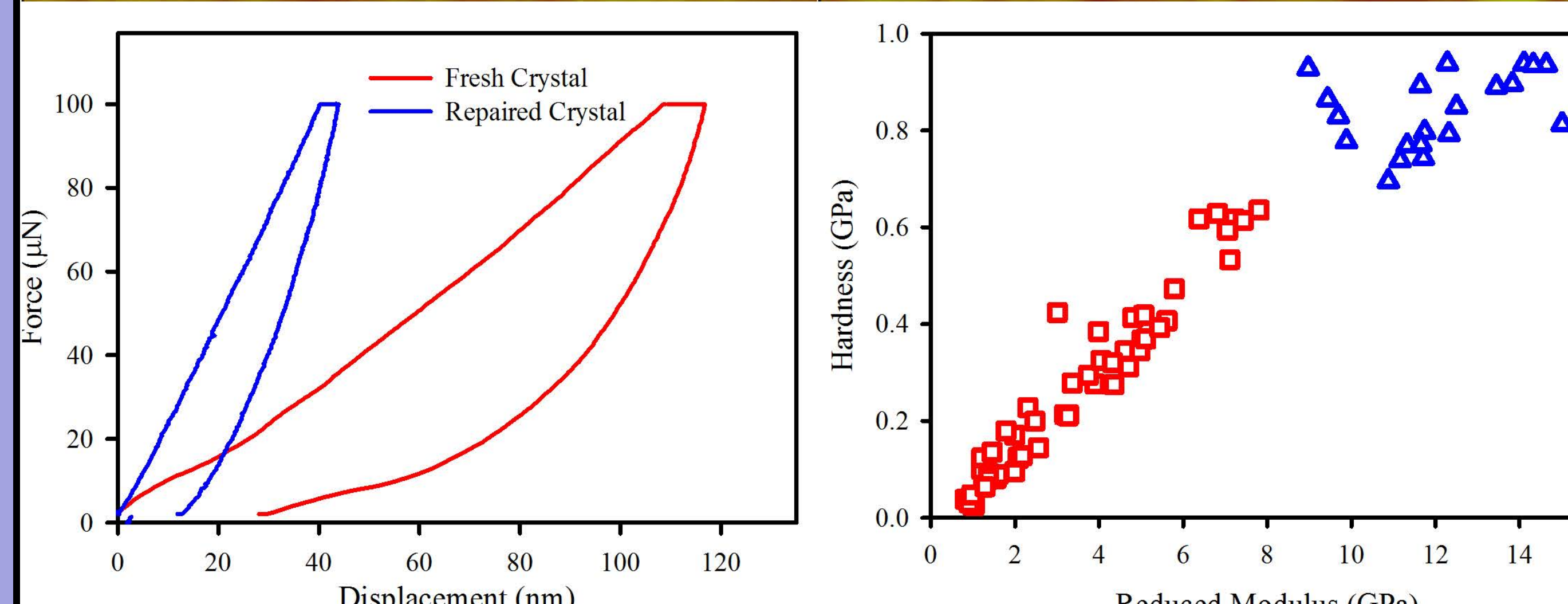
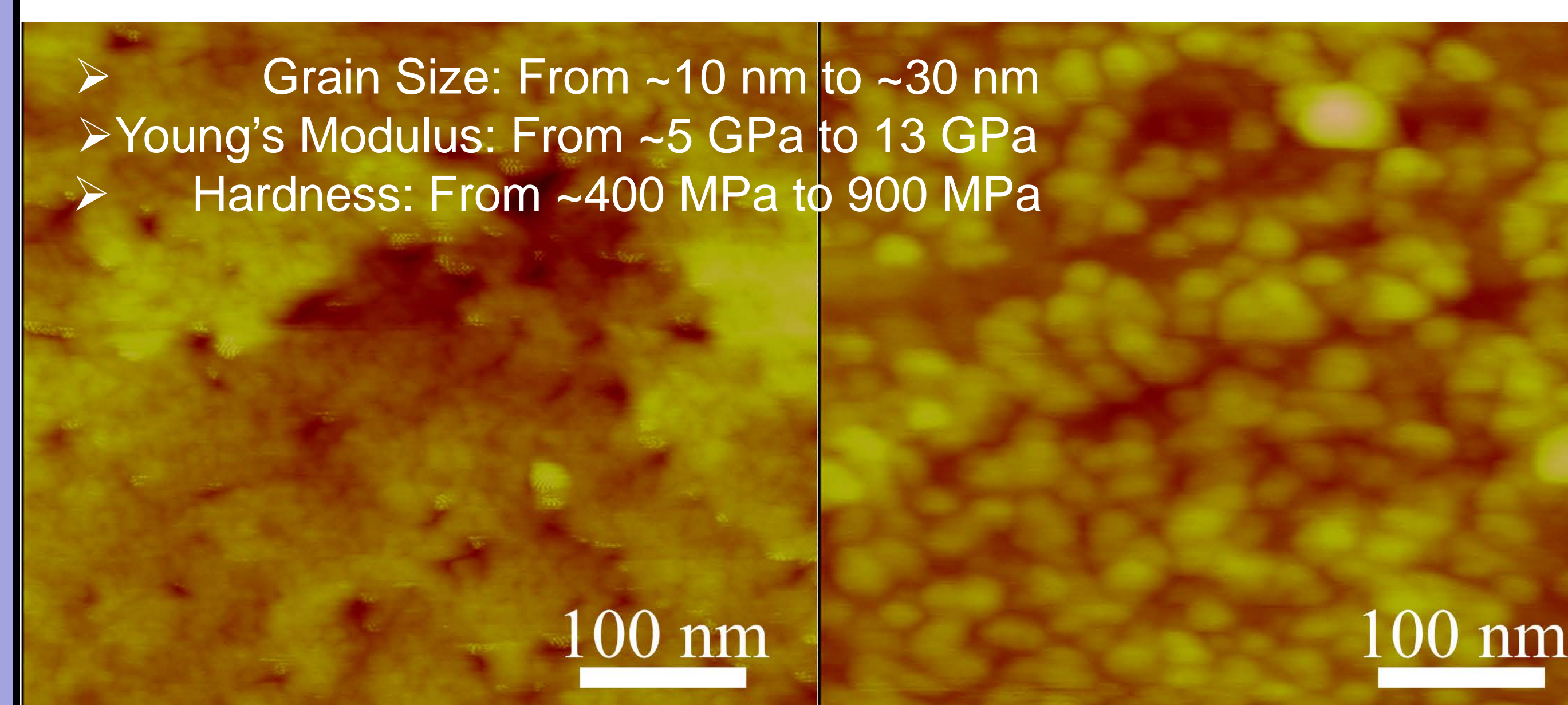
Heterogeneous structure



➤ Complex nanoparticle-assembly revealed on the surface.

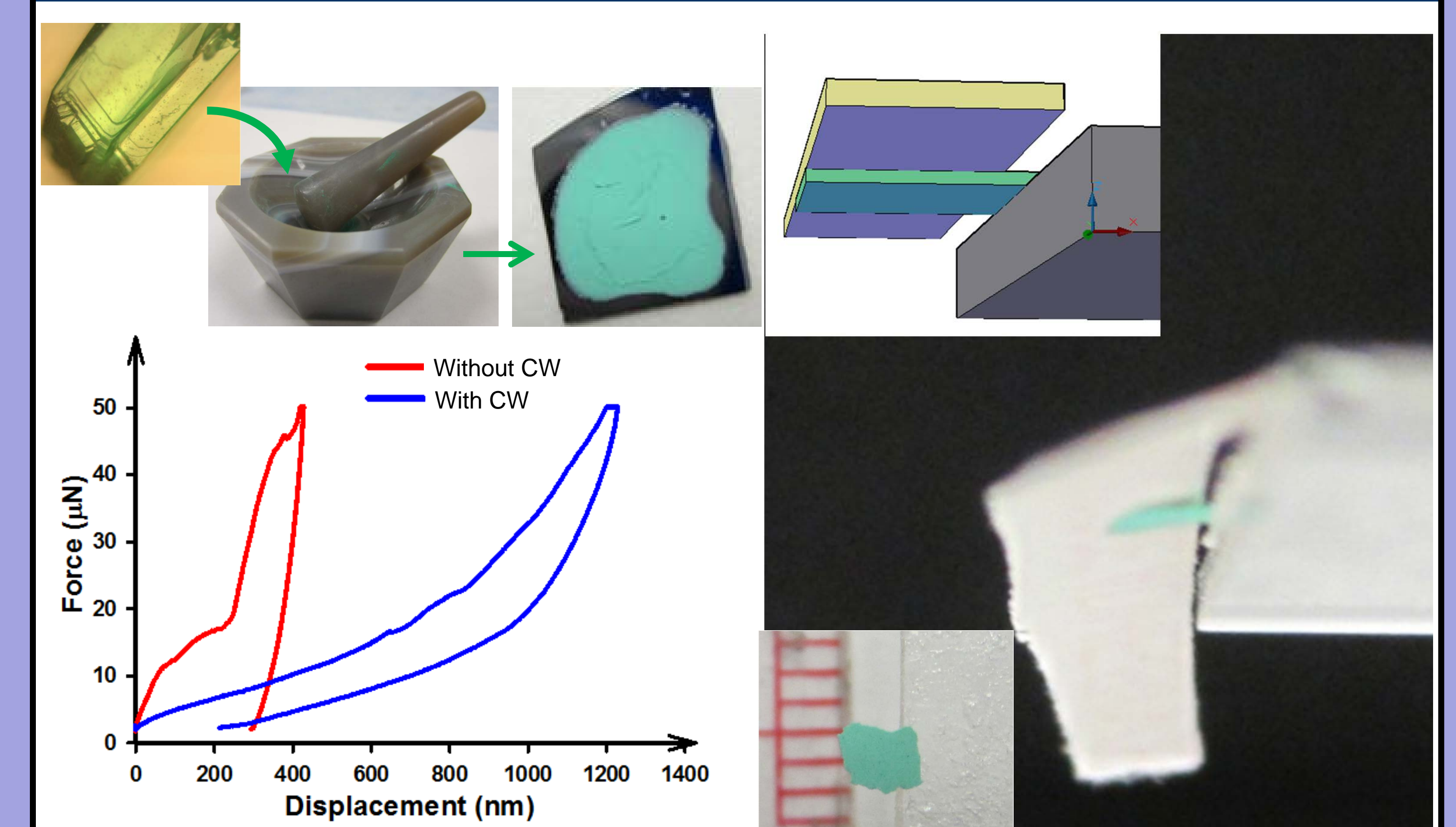
Surface Cold Welding: Nano scale

- Grain Size: From ~10 nm to ~30 nm
- Young's Modulus: From ~5 GPa to 13 GPa
- Hardness: From ~400 MPa to 900 MPa



➤ No any changes revealed in XRD expect the full width at half maximum (FWHM).

Powder Cold Welding: Micro scale



- After cold welding, the powder-assembly is elastic;
- The free standing film is of similar yield strength as polycarbonate.

Conclusions

- Heterogeneous feature is revealed in MOF crystals;
- Cold welding is achieved with Cu-MOF ;
- Cold welding makes application possibility of MOFs in engineering materials .