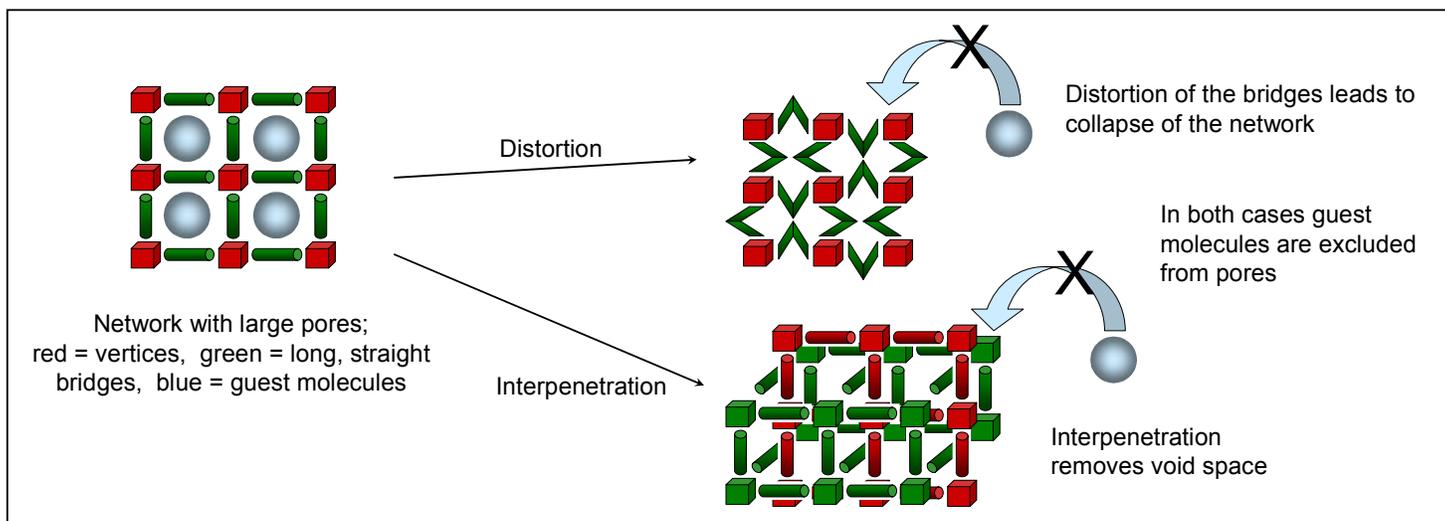


Three Interpenetrating Lattices in $\text{KMnAg}_3(\text{CN})_6$

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Motivation:

- Network solids with molecular components are useful as solid state functional materials, e.g. molecular magnets
- New direction: porous molecular networks suitable for reversible storage of guest molecules, e.g. hydrogen
- Challenge: porous networks are difficult to make — must prevent interpenetration and distortion



Results:

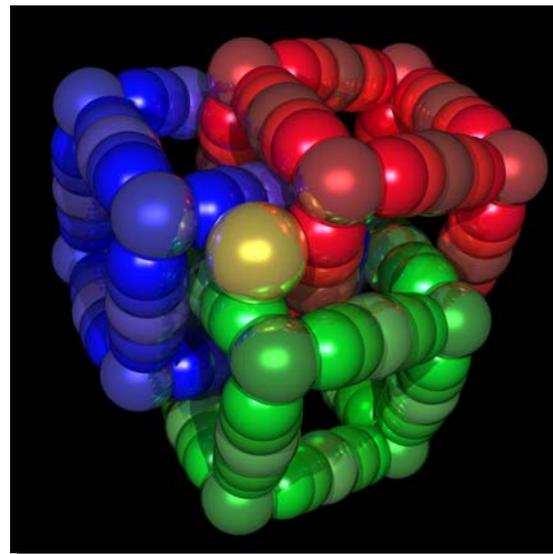
- New $\text{KMnAg}_3(\text{CN})_6$ forms triply interpenetrating α -Po network, with Mn^{2+} ions at vertices
- Crystal structure from single crystals
- Unambiguous C vs. N assignment: Mn–N, Ag–C coordination
- Resolved space group ambiguity: $P312$ with ordered K^+ atoms
- $\text{Ag}(\text{CN})_2^-$ bridges rigid: no distortion
- Tetrapropylammonium template not sufficiently large to prevent interpenetration

Significance:

- Exceptionally high quality structure ($R_1=1.2\%$)
- Proves suitability of linear polyatomic molecules as rigid bridges
- Exemplifies difficulties in forming open pore structures
- This work featured in April 2003 newsletter of the International Union of Crystallography

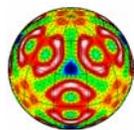
Future Directions:

- Explore other rigid bridges, e.g. organic dicarboxylates and disulfonates: metal–organic frameworks (MOF)
- Prevent interpenetration with use of larger template molecules
- Develop porous molecular network solids for hydrogen storage



Crystal structure of $\text{KMnAg}_3(\text{CN})_6$ with three lattices shown in different colors. Potassium drawn in gold.

Reference: Urs Geiser & John A. Schlueter: " $\text{KMnAg}_3(\text{CN})_6$, a new triply interpenetrating network solid", *Acta Crystallogr. C* 59, i21–i23, 2003.



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