Nanoporous Materials: Functional Silicates and Metal Organic Frameworks

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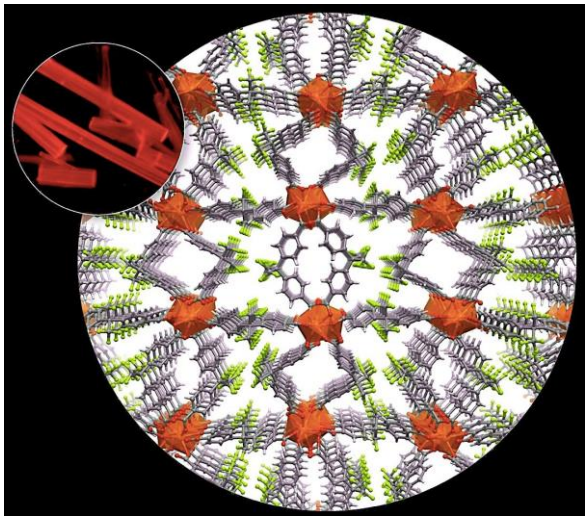
I shall highlight some of the work carried out in Aveiro on nanoporous transition-metal and lanthanide (Ln) silicates and on Ln-bearing coordination polymers (or metal organic frameworks, MOFs). The main focus will be on the design of lanthanide-bearing nanomaterials for sensing temperature via light emission [1-4], and nanosystems for health-related applications, such as drug delivery [5-6] and treating bone tissue disorders [7]. Another outstanding example is the use of zirconium silicates as pharmaceuticals for treating hyperkalemia (excess K^+ in serum), providing an intriguing case study of a real translation from the bench to the bedside. A final example of health-related and sustainability applications is provided by the anti-mosquito activity of a titanium-based metal–organic framework supported on textile fibres [8].

While nanoporous (zeolite-like) silicates are highly robust (thermal and chemical) systems, allowing applications in relatively harsh conditions, it is very challenging to synthesise the desired architectures and modify them post-synthesis. In contrast, MOFs operate in milder conditions and often lack robustness but they are much more amenable to 'rational synthesis' and post-synthetic modification. Thus, together, metal silicates and MOFs provide a wonderful playground for chemists and a toll box for engineering applications.



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