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Recent adventures with porous materials: triggered release and anti-aging membranes

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Metal Organic Frameworks (MOFs) show unprecedented capacity to store small molecules, however, the proposed methods to release these molecules are not yet feasible at a meaningful scale, largely due to the strong binding of stored molecules and the thermally insulating nature of the adsorbent. For example, carbon capture (and release and subsequent storage) from coal-fired power plants has been estimated to require between 25 and 40% of the energy output of the power plant though a more recent estimate was even higher. Whilst desorption from insulators such as zeolites has been overcome by the passing of hot gas through the bed, this is at an efficiency cost, and lowers the versatility of use. This problem is even more acute given the potential platform applications of MOFs where large flows of hot gas are often not at all possible. This presentation will describe the incorporation of metal nanoparticles within MOFs and the use of magnetic induction heating to release a series of stored molecules with unprecedented efficiency, known as magnetic induction swing adsorption (MISA). Magnetic induction is the most energy efficient means of heating, hence its widespread usage in domestic cooking. Its use within Metal Organic Frameworks, where we have been able to show they act as 'nanoheaters', overcomes the inherently thermally insulating nature and we have been able to release 100% of stored molecules. Further research has shown combination with light responsive moieties further increases the energy efficiency (MaLISA), and recently the energy efficiency record was broken with these materials.

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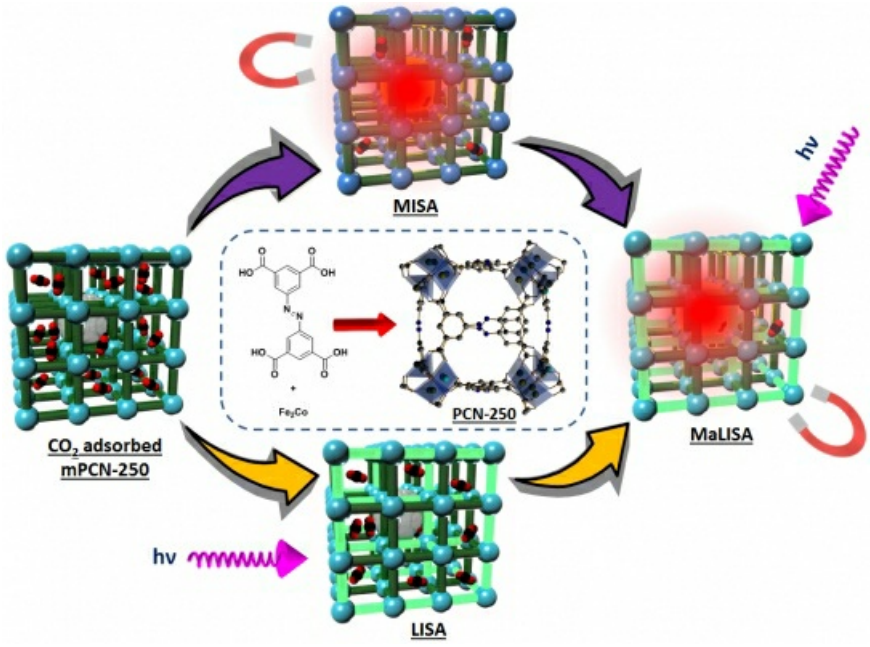

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