PM23

Supercritical CO_2-assisted flow chemistry for synthesizing switchable molecular nanomaterials

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PM23 SUPERCRITICAL CO_2-ASSISTED FLOW CHEMISTRY FOR SYNTHESIZING SWITCHABLE MOLECULAR NANOMATERIALS

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Molecular switches are getting increasingly implemented in functional materials for sensing applications and in molecular electronics. Among this family, the spin crossover (SCO) materials are studied with great interest, due to their ability to change of electronic configuration between a low-spin state (LS) and a high-spin state (HS). The commutation can be triggered by an external stimulus such as temperature, pressure or light-irradiation [1]. The most interesting materials in this field are Fe(II) complexes and particularly 1D-coordination polymers based on the 4R-1,2,4-triazole ligands and iron(II) salts, due to an efficient switching at room temperature associated to thermochromic properties and memory effects [2,3]. These features allow considering multiple applications (temperature sensors, data storage, etc…) [4,5]. The limitations encountered with the classical batch synthesis approaches are the quantities obtained, as well as the reproducibility, the size and the size-distribution of the particles. These issues can be overcome by a flow chemistry approach. The continuous system has already been used successfully to get different kinds of materials [6], from polymers [7] to metal-organic frameworks [8], leading to high-quality sub-micrometric, or even nanoparticles. The main advantages of this process are: (i) ultra-short residence times, (ii) secured reproducibility and (iii) process reliability. In this work, we have transposed the classical batch synthesis method to a continuous system, coupled with a supercritical CO_2 ($scCO_2$)-assisted drying, in order to produce large amounts of such materials. The SCO candidate for this study is the $[Fe(Htrz)_2(trz)](BF_4)$ molecular compound known to be the most stable of the triazole family [9] and shows SCO hysteresis features, even upon size reduction [10]. This study compares the particles (size, properties) obtained using a flow reactor coupled to $scCO_2$ drying, with ones obtained through batch synthesis.

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