PEPTIDES AS VERSATILE SCAFFOLDS FOR MOLECULAR SPINS IN THE CONTEXT OF QUANTUM TECHNOLOGIES

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Over the last decade, the field of Molecular Magnetism has been refreshed with the discovery that mononuclear f-element complexes display a single-molecule magnetic (SMM) behavior and quantum phenomena arising from their physical nature. [1] Owing to their magnetic properties, quantum effects and nanometric size, SMMs have been proposed as promising candidates for the development of high-density magnetic memories, magnetic refrigeration, quantum computing devices and several applications in molecular spintronics. [2]

However, any future technological realization using molecular spins is subordinated to the development, enhancement and control of the possibilities of nanoorganization. In this context, we propose the use of peptides as suitable and versatile platforms for quantum technologies. [3] We focus on Lanthanide Binding Tags –developed in the field of Biochemistry– producing coherent spin qubits ($\simeq$ 20 coherent oscillations for Nd^{3+}, Gd^{3+} derivatives). These spin qubits are modified biochemically in order to affordably prepare paramagnetic, chiral, Self-Assembled Monolayers (SAMs) on Au(111). Our results suggest that this is a promising structure for spintronics applications. Moreover, through bacterial biosynthesis, we offer the possibility of inexpensively scaling up the number of qubits in the same molecule. Finally, we discuss the challenges and opportunities opened by this encouraging new field. [4]

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