NONLINEAR OPTICS IN MOLECULAR "SINGLE CHAIN MAGNETS"

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Recently it has been shown that the problem of chirality can be efficiently addressed, besides the more common linear optical tools, using nonlinear optical effects. With this optical tools distinctions can be made between electrical and magnetic effects even in zero applied field and a distinction between local and non-local susceptibilities has been introduced [1].
Anyway, for the sake of simplicity, only organic thin films of molecules or deposited ordered structures have been investigated. Organic materials are anyway, with the due exceptions, intrinsically diamagnetic, while these techniques should be applied, to exploit their full potential, on the investigation of the interplay between optical and magnetic properties.
We then decided to start a nonlinear optical characterization of molecular magnets, whose properties can be rationally tuned thanks to the means of classical chemistry [2]. In particular we investigated the magnetic polymeric compound CoNitPhOMe [3], the archetype of a novel class of one-dimensional materials displaying slow relaxation of the magnetisation at low temperature without three-dimensional ordering. This slow dynamics has been explained with Glauber's model for Ising spin chains and is due to the simultaneous presence of high anisotropy of the magnetic centres and weak interchain magnetic interactions.
The contemporary presence of both chirality and Ising anisotropy in CoNitPhOMe can lead to the observation of novel magneto-chiral non-linear effects that can both give valuable information on the magnetic structure of these innovating materials and represent a novel mechanism for nonlinear generation to be exploited in advanced materials. Our study, then, focused on the individuation, thanks to an appropriately designed setup, of previously unknown chiral magnetic contributions to SHG

References:

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