Optical power limiting of laser radiations by carbon nanostructures

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In recent years considerable efforts have been put in understanding the nonlinear optical response of various materials in order to realize photonic devices of practical use. [1-3] In that view, achieving a deeper insight into the physical mechanisms from which nonlinearities of materials arise is an essential step in order to optimize the required performance. On the other hand, with the increasing use of lasers in daily life there is an increased concern of protecting both the human eyes and/or optical sensors/detectors against laser induced damage. To address this issue continuous efforts are being made, focusing on the synthesis and characterization of new optical limiting materials, with increased sensitivity and capacity to cover broadband optical radiations, ranging from UV to IR wavelengths. Among the various investigated materials suitable for optical limiting applications, nanocrystalline diamonds and carbon dots are considered as important candidates. The former having been developed very recently, can be easily synthesized in a variety of shapes and dimensions while their surface functionalization allows the attachment of different organic, inorganic, polymeric and biological species, imparting them with high water solubility, ionic character and a lot of other attractive properties. [4-7] The latter nanostructures, have also attracted considerable attention as promising materials for many applications including optoelectronics, all-optical switching and optical limiting. [7-9] However, their NLO response has not been investigated in details. Herein, in this study, the optical limiting properties of some crystalline NDs and amorphous CDs have been investigated and the results are discussed and compared with other past studies.

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