Description for general public

Diamond is an allotropic form of carbon. It consists of carbon atoms arranged in a regular structure. The structure may have defects such as admixture atoms or the lack of some of the carbon atoms when an empty space, the so called *vacancy* is formed. When a nitrogen admixture appears next to the vacancy in a diamond crystal, the specific Nitrogen-vacancy (NV) color center is formed which has specific physical properties and important applications. For example, a by acting on the NV center by light or microwaves, one can control its spin and therefore use it as a quantum controller. This solution may enable the realization of quantum computers and ultra-sensitive biosensors.

Unfortunately, the distribution of nitrogen vacancies in diamond is random and the attempts to control their occurrence were, so far, unsuccessful. The control of this distribution can be achieved by using specifically introduced nanodiamonds in the optical fiber that interact with both light and microwaves. The authors study the possibility of placing the diamonds with nitrogen vacancies in the optical fibers and read/write quantum information contained therein in the form of a specific spin. Optical fibers can be arbitrarily long to allow transport of the information and have a small size so they can be miniaturized to the size of a microcomputer or a biosensing device.