Abstract

Thanks to their unique properties and high biocompatibilities, fluorescent nanodiamonds are promising representatives of modern carbon nanomaterials with a broad range of applications. Nevertheless, their wider use is limited because of weak fluorescence intensity and low colloidal stability in the biological environment. The optimization of treatment procedures and development of new suitable surface designs is therefore critically needed.

In this study, several key steps for fluorescent nanodiamond treatment have been optimized, leading to both a substantial increase in fluorescence intensity and to significantly lower surface damage caused by graphitization. Further, a new high-throughput irradiation technique was developed. The influence of surface chemistry on the fluorescence parameters was studied using partial fluorination of the functional groups on the nanodiamond surface. A novel method which significantly affects the interaction of nanodiamonds with biological systems by increasing of the homogeneity and circularity was developed. The potential of nanodiamonds for future medical and biological research was demonstrated on particles with complex surface architectures that enabled targeting and therapy of tumor cells. Moreover, a strong and highly selective affinity of fibroblast growth factors to diamond surfaces was discovered and demonstrated using both *in vitro* and *ex vivo* models.