Zeta Potential Study of Detonation Nanodiamonds

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The first syntheses of nanodiamonds by detonation were performed in the USSR in 1963. Intensive studies and production of nanodiamonds were performed simultaneously at several research centres in the USSR, but the production potential exceeded the scale of applications [1]. A few years ago, nanodiamonds have known a renewal of interest and much research is presently undertaken about the potential applications for this material [2].

One of the key points in order to use nanodiamonds for applications is to obtain stable suspensions with well separated particles. Two major parameters have to be considered, the material and the liquid medium:

- For the *material*, the nature of the functional groups present at the nanodiamond surface is determinant. It strongly depends on the environment in which the explosive charge is fired and the purification treatment applied. The oxidation treatment performed at ISL during the purification process allows obtaining very hydrophilic nanodiamonds which can be dispersed in an aqueous medium. Such suspensions (0.3 g/L) remain stable during more than one year.

- Concerning the *liquid medium*, the polarity, the ionic strength and the pH of the dispersant are important factors to take into account for obtaining suitable suspensions.

The zeta potential (ξ) of a sample represents the displacement ability of the particles in a liquid medium under an applied electrical field. According to ξ values, a suspension remains stable along time ($|\xi| > 30\text{mV}$) or flocculates ($|\xi| < 30\text{mV}$).

Therefore, different nanodiamond suspensions were investigated by zeta potential in order to determine the best conditions to obtain stable suspensions.

[1] V.V. Danilenko, *Phys. Solid State* **46**(4), 595 (2004).

[2] V.Yu Dolmatov, M.V. Veretennikova, V.A. Marchukov, V.G. Sushchev, *Phys. Solid State* **46**(4), 611 (2004).