

## The Reflection of Very Cold Neutrons from Diamond Powder Nanoparticles

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We investigated the interaction of very cold neutrons (VCN) with a powder of diamond nanoparticles and observed extremely intense scattering of VCN even off thin powder samples. We show that this intense scattering would allow us to use nanoparticle powders very efficiently as the very first reflectors for neutrons with energies within a complete VCN range up to 10<sup>-4</sup> eV, thus bridging the energy gap between efficient reactor reflectors for thermal and cold neutrons, and the Fermi potential for ultracold neutrons (UCN).

This intense scattering has been expected [1]; it agrees qualitatively with the model of independent nanoparticles at rest [2]. It provides a unique opportunity to study the dynamics of nanoparticles at a surface, in the material bulk [3-5], and even probably to cool VCN down to the UCN energy range [1, 6-8]. On the other hand, other studies have shown that the quasi-elastic scattering of UCN at nanoparticles on solid surfaces could be responsible for false effects in storage experiments in fundamental physics [9-13].

The observed efficient reflection of VCN has a number of practical applications, including the storage of VCN in closed traps, reflectors for VCN and UCN sources, the more efficient guiding of VCN and, probably, of even faster neutrons.

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