Assembling and Fine Analysis of Ni/MgO Core-Shell Nanoparticles

Supporting Information

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Figure S1. (a) SEM image of Ni nanoparticles deposited on Si/SiOx substrate. (b) SEM images from the same sample, with a higher magnification; (c) lateral size distribution of the particles shown in
figure 1b) (histogram), and best fitting curve (continuous line). The histogram was fitted with a log-normal function. The average lateral size is estimated to be $<d> = 5.5$ nm.

**Methodology of fringe mapping (fig. 4)**

To obtain the map for each periodicity the image has been Fourier transformed, the ring of Fourier points at this periodicity is divided in patches. After the application of a Gaussian mask for each patch, these are separately back Fourier transformed to form intensity map as in [s1, s2]. The amplitude maps for each patch are then incoherently summed to form the map for each fringe, colored with false colors. This method permits to maps all fringes at the same frequency regardless of their orientation.


Fig s2 a,b shows a HRTEM image of samples A and B in a different projection from what shown in fig 4. A model of the atomic structure of the Ni particle in this projection is shown in fig (c) while fig (d) is a multislice simulation of the particle as in fig 2b. The defocus ($\Delta f=-123\text{nm}$) has been deduced.
from accurate analysis of the amorphous diffractogram while a tilt of 40 mrad has been added to improve the similarity with the fringes in the center of the particles. Both fig a and b show fringes outside the first Mg shell that can be credited to additional MgO. These fringes show, in most cases, continuity with the Ni fringes.

**Figure S3.** Additional low magnification TEM images. Figure a is a slightly out of focus image of sample A obtained with a JEOL 2011 microscope operated at 200KeV, with a 0.19 nm nm point resolution and a thermoionic LaB$_6$ emitter. Figure b is obtained with the 2200 Fs TEM in the text. Both images clearly evidence the existence of a complete alas not uniform shell.