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***In Situ* Observation of Phase Transformation in Iron Carbide Nanocrystals**

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Highlights

- *in situ* observation of phase transformation at nanoscale;
- The formation and switching of *h*-Fe₇C₃ and *o*-Fe₇C₃ nanocrystals;
- Structural analysis of iron carbide nanocrystals by FFT from HR-TEM images;
- Experimental evidence for the stability of the crystal structures.

Abstract: This paper reports on the *in situ* observation of phase transformation in an iron carbide nanocrystal encapsulated in a graphitic shell by means of high resolution transmission electron microscopy (HR-TEM). A Fe₇C₃ nanocrystal in orthorhombic (*o*-Fe₇C₃) structure with carbon graphitic cover is captured at the initial time of the experiment. Under the projection of a high-energy electron beam (200 kV), the graphitic carbon layer evaporates gradually and structural changes in orthorhombic (*o*-Fe₇C₃) crystal manifests simultaneously. Specifically, changes in crystal direction

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