Supplementary Material to the article "Thermal transformations of ferrocene $Fe(C_5H_5)_2$ at pressures of 10 GPa and temperatures up to 2200 K"

Synthesis of ferrocene

^{57}Fe enriched Fe_2O_3 sample (97 mg, 0.6 mmol) was placed in a 20 mL flask and dissolved in hydrochloric acid (500 µL, 30% aqueous solution) with stirring on a magnetic stirrer for 1 h at 70 °C. The resulting orange solution was evaporated to dryness and dried at 130 °C. The flask was purged with argon and the solid residue ($FeCl_3$) was dissolved in tetrahydrofuran (10 mL) under inert atmosphere. The solution was frozen by placing the flask in a liquid nitrogen bath and sodium cyclopentadienide (528 mg, 6 mmol) was added. The mixture was stirred for 2 hours under gradual warming to room temperature. Then methanol (5 mL) and acetic acid (1 mL) were added to neutralize the excess of cyclopentadienide. The solution was evaporated in vacuum, dried, the residue was dissolved in a CH_2Cl_2:C_6H_{14} (1:2) mixture and chromatographed using a short column (5 cm) with silica gel. The orange fraction was collected, evaporated and dried. As a result, 32 mg (yield 14%) of ferrocene in the form of orange crystals was obtained.

Schematic diagram of the laser heating of ferrocene in a diamond anvil cell (DAC).

The principal optical scheme of the setup for laser heating of the sample in DAC is presented in Figure S1. Laser radiation was transmitted from the laser collimator by means of two narrow-band mirrors M_1, M_2 and was driven into the Ob_2 lens (GeoHeat 40_NIR) to focus the radiation on the sample surface. After passing Ob_2, the radiation was reflected on the polarization beam splitter cube BS_1 and wound up inside the DAC. When heating ferrocene, its surface begins to emit in the infrared and visible ranges, so it is possible to register the spectrum and obtain information about the temperature distribution on its surface. A multispectral MC camera (Ximea MQ022HG-IM-SM4X4-VIS3) was used to record the Planck curve. The peculiarity of this camera are integrated narrow-band spectral filters located directly on the surface of the matrix, which allows to obtain simultaneously 16 images at different wavelengths with a spatial resolution of 512 x 272 pixels in one frame. This allows the measurement of fast non-stationary processes. An Ob_1 micro lens (10X Mitutoyo Plan Apo NIR) and a long-focus achromatic staple L_1 (600 mm) were used to transfer the image from the DAC and form it at the camera receiver. For easy focusing on the sample surface in the DAC a beam splitter cube BS_2 is used, and a fiber light source LS (incandescent lamp power 150 W, fiber light diameter 4 mm) is used as a source of broadband visible radiation. The light from the lamp is collected by the lens L_2 and focused on the input aperture Ob_1.

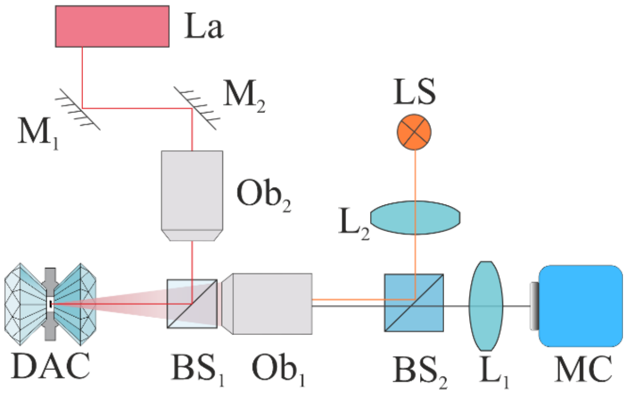

Fig.S1. Schematic diagram of the installation of laser heating of ferrocene in DAC. La - 1064 nm infrared laser, M_1, M_2 - mirrors, Ob_2 - GeoHeat 40_NIR lens, BS_1 - polarized beam splitter, DAC - diamond anvil cell, Ob_1 - 10× micro lens, BS_2 - beam splitter, L_1, L_2 - lenses, MC - multispectral camera.