

Supplementary Information

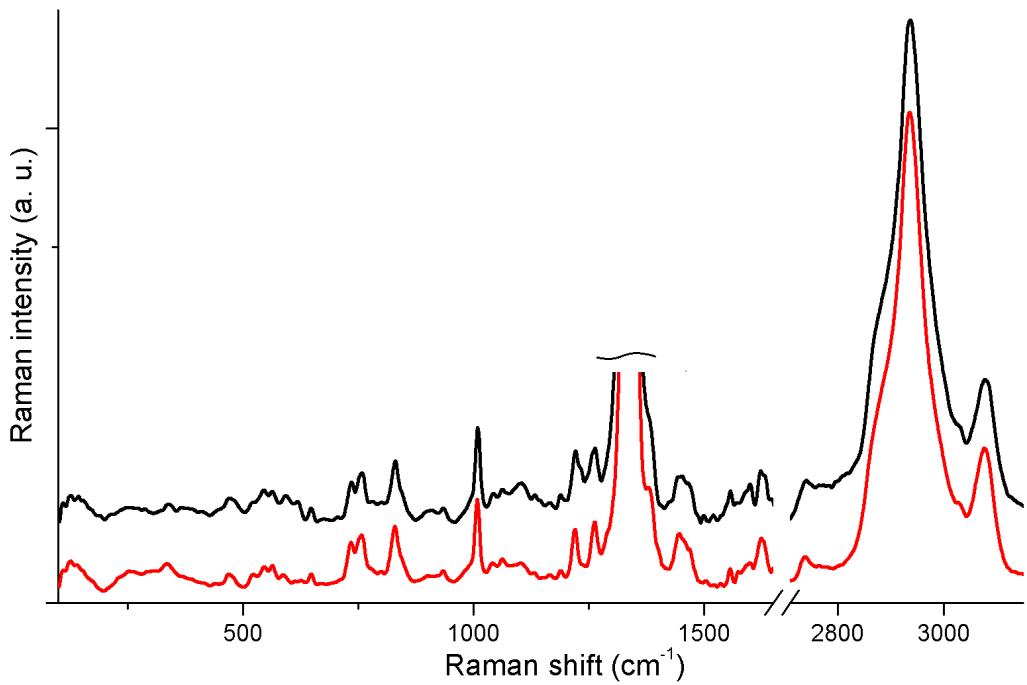


Figure S1. Raman spectra of the complex hydrocarbons system at 1.4(0.2) GPa and ambient temperature (red curve) and after heating for 12 hours at 723(10) K (black curve).

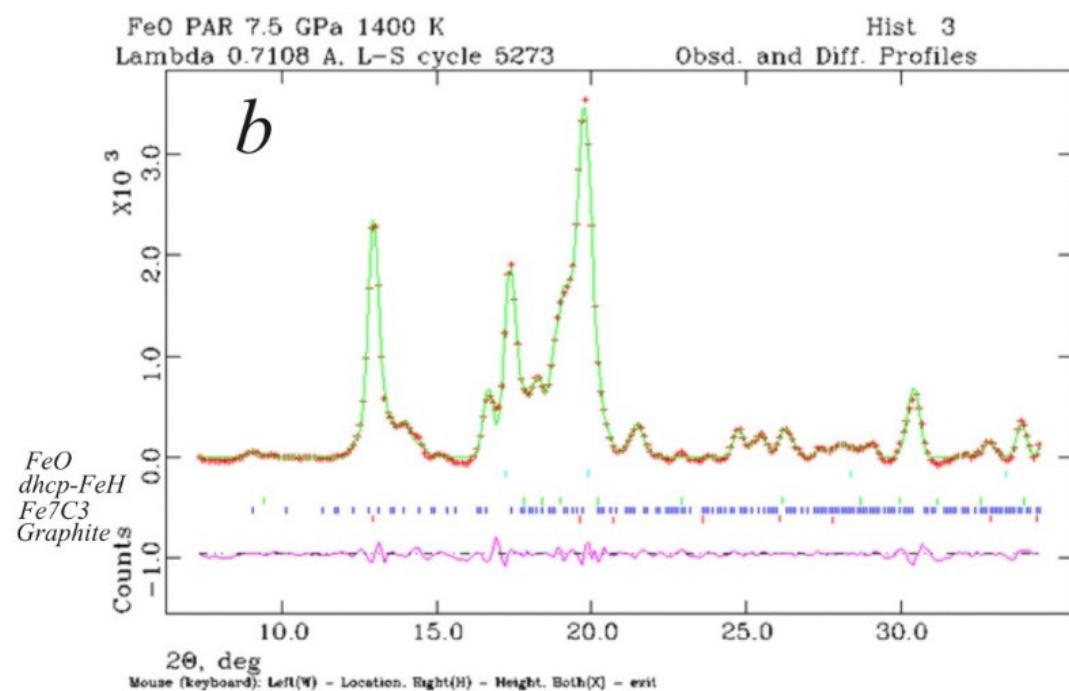
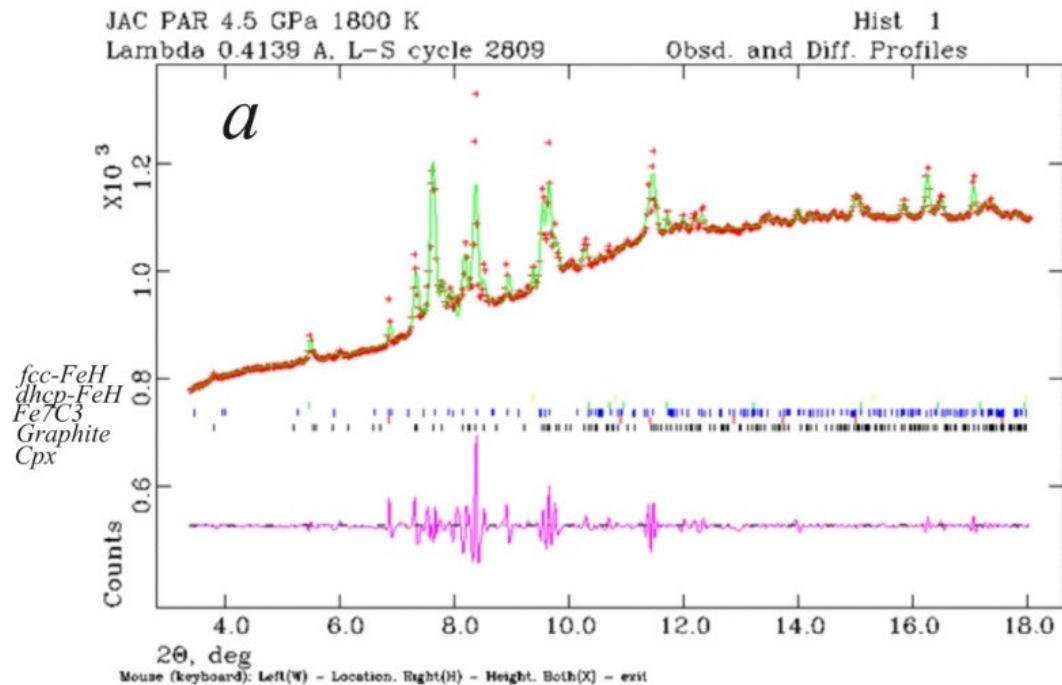


Figure S2. Examples of X-ray diffraction patterns collected on temperature-quenched samples in DACs at different pressures that have been processed using full-profile GSAS software. **(a)** Glass of pyroxene composition + paraffin after heating at 4.5(1) GPa and 1800(100) K; **(b)** Wüstite (FeO) + paraffin after heating at 7.5(2) GPa and 1400(100) K. While interpretation of the complex diffraction patterns on their own are ambiguous, phase assignments are more robust in combination with results of Mössbauer and Raman spectroscopies.

Table S1. Characteristics of paraffin oil (from Merch KGaA, EMD Millipore Chemical 1.07160.1000).

Number	Property	Units	Value
1	Density at 20 °C	kg/m ³	845–890
2	Dinamic viscosity at 20 °C	mPas	110–230
3	Kinematic viscosity at 40 °C	mm ² /sec	34.5

Table S2. Characteristics of crude oil from the Korchaginskoe deposit (Astrakhan region).

Number	Property	Units	Value
1	Pour point	°C	-24
2	Density at 20 °C	kg/m ³	817
3	Molecular weight	kg/kmol	211
4	Viscosity at 20 °C	mm ² /s	4.9
5	Asphaltene content	% weight	0.2
6	Silica-gel pitch content	% weight	10.1
7	Petroleum wax content	% weight	5.6
8	Sulphur content	% weight	0.543

Table S3. Hyperfine parameters of Mossbauer spectra (Figure 2).

Spectrum	P, GPa	Iron component	Color in Fig	δ , mm/s	QS, mm/s	BHF, T	Int, %
a	4.5	Pyroxene glass	Brown D	1.112	2.317	-	66.4
		FeH	Blue S	0.415	0	29.1	33.6
b	6.9	new Fe ²⁺ comp	Green D	0.570	1.267	-	26.1
		FeH	Blue S	0.555	0	28.732	53.1
		α -Fe	Black S	-0.041	0	32.952	20.8
c	7.5	Mixed phases	Orange D	0.425	1.170	-	15.7
		FeH	Blue S	0.454	0	28.312	11.7
		Fe ₇ C ₃ a	Pink S	0.111	0	15.523	19.2
		Fe ₇ C ₃ b	Pink S	0.078	0	19.384	44.6
		α -Fe	Black S	-0.060	0	33.000	8.9