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Supplemental Information for

Experimental determination of carbon diffusion in liquid iron at high pressure

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The Online Material contains the following information:

- Table OM1 listing the starting composition of the experiments.
- Supplementary figures OM1 and OM2.

Table OM1: Starting composition of the iron and iron alloy. The data represent 50 spot analyses on each sample and σ stands for standard deviation from the mean.

	Iron		Alloy	
Metal	wt.%	1σ	wt.%	1 σ
Fe	99.97	0.47	96.89	2.49
C	-	-	2.49	1.24
Total	99.97	0.47	99.38	1.74

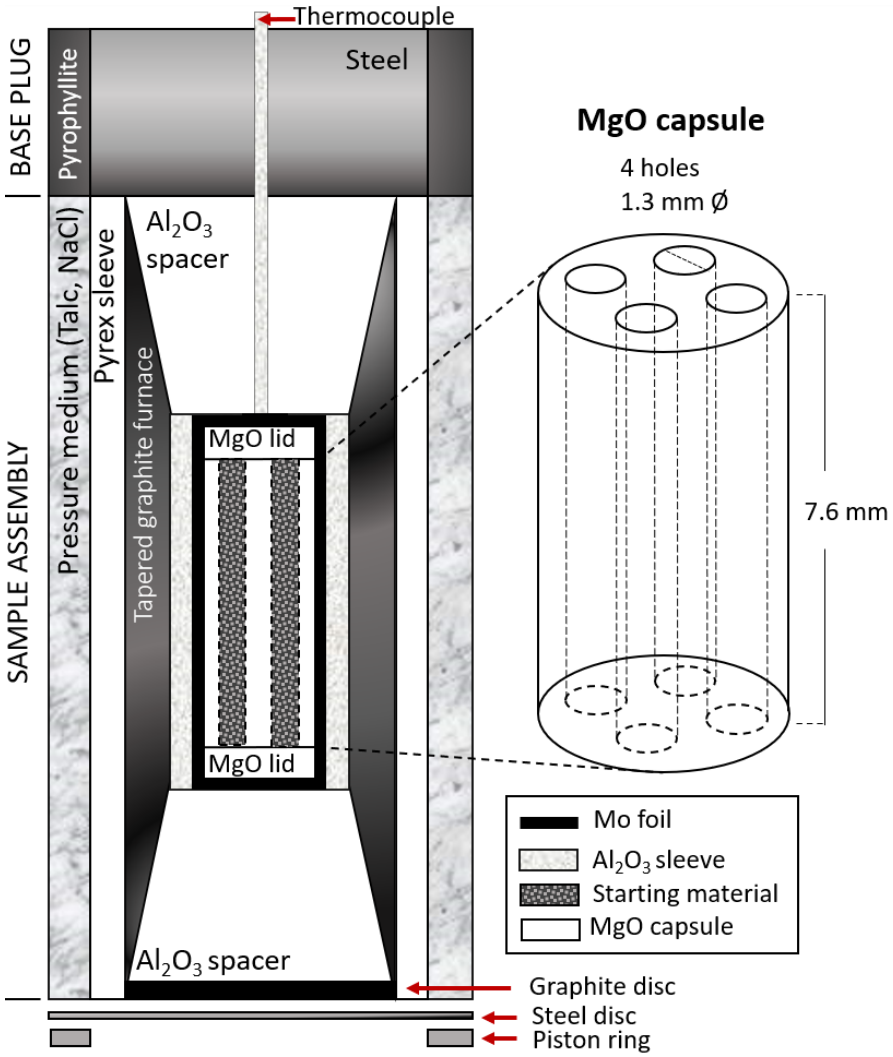

Fig. OM1: Piston cylinder assembly used to sinter the Fe–C alloy. A mixture of fine-grained Fe and graphite metallic powders (each with purity of 99.9%) was packed tightly into a four-chamber MgO capsule, which was then loaded into a Mo-foil capsule, and sintered into solid rods at 1.5 GPa and 1323 K for 6 h. Sintered rods were removed, cut, polished on the ends to a 0.25-μm finish, and checked for chemical homogeneity by electron microprobe (Table S1). The diameter of the recovered alloy rod was approximately 1.2 mm, which matched that of the machined pure iron rod used in the diffusion experiments (Figs. 1, 2).

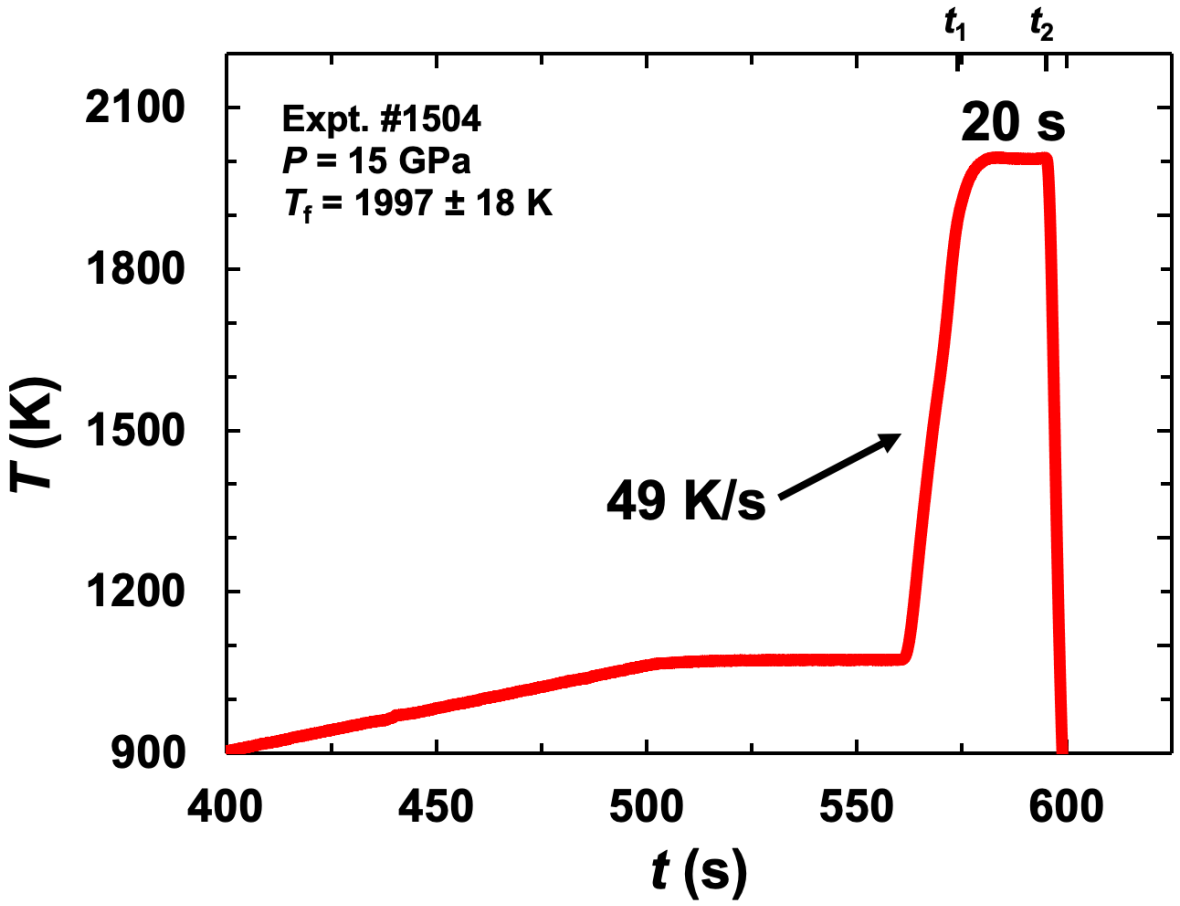

Fig. OM2: Typical heating profile for the diffusion experiments. Temperature overshoot did not pose a problem using the prescribed heating protocol because the programmed heating rate slightly decreased immediately prior to reaching the target temperature. The peak temperature (T_p) and associated error for each experiment reflect the average and standard deviation of the thermocouple reading between time (t_1) when the heating rate slowed by 30% of the programmed value and quenching (t_2), where $t_P = t_2 - t_1$. In preliminary experiments, we tried a combination of automatic and manual heating to try to minimize the "roll-over effect" (i.e., gradual decrease of heating rate upon approaching T_p) by setting a fictive target temperature using a PID controller several hundred degrees above T_p and then switching to manual control about 50 K below the true T_p. However, we found this approach to be unstable, especially for short t_P, and therefore opted for the previously described procedure.