Supplementary material

Enhanced stability of fused iron catalyst under realistic Fischer-Tropsch synthesis conditions: insights into the role of iron phases (χ-Fe_5C_2, θ-Fe_3C and α-Fe)

Juan Zhang[a,b], Mohamed Abbas [a,c,d],* Wentao Zhao[e], Jiangang Chen[a,*]

[a] State Key Laboratory of Coal Conversion, Institute of Coal Chemistry, Chinese Academy of Sciences, Taiyuan, 030001, China
[b] University of Chinese Academy of Sciences, Beijing 100049, China
[c] Faculty of Chemistry, Jagiellonian University, Ul. Gronostajowa 2, Krakow, 30-387, Poland
[d] Ceramics Department, National Research Centre, El-Bohouth Street, 12622 Cairo, Egypt
[e]Sanju environmental protection new material Co., Ltd

Corresponding author:

Prof. Chen Jiangang and Prof. Mohamed Abbas

State Key Laboratory of Coal Conversion, Institute of Coal Chemistry, Chinese Academy of Sciences, Taiyuan, 030001, China

E-mail Address: chenjg@sxicc.ac.cn, abbas@chemia.uj.edu.pl, Mohamed_abbas83@yahoo.com

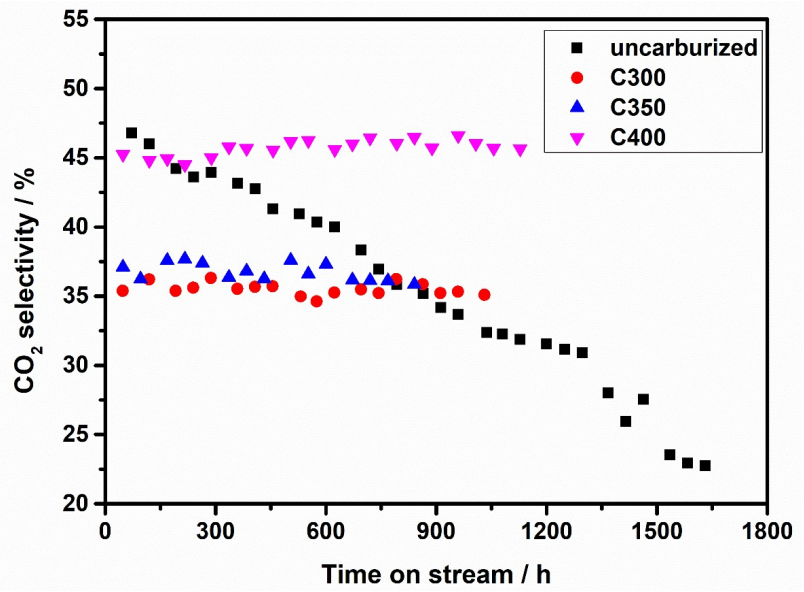

Fig. S1. CO_2 selectivity versus Time on stream for un-carburized and carburized catalysts..

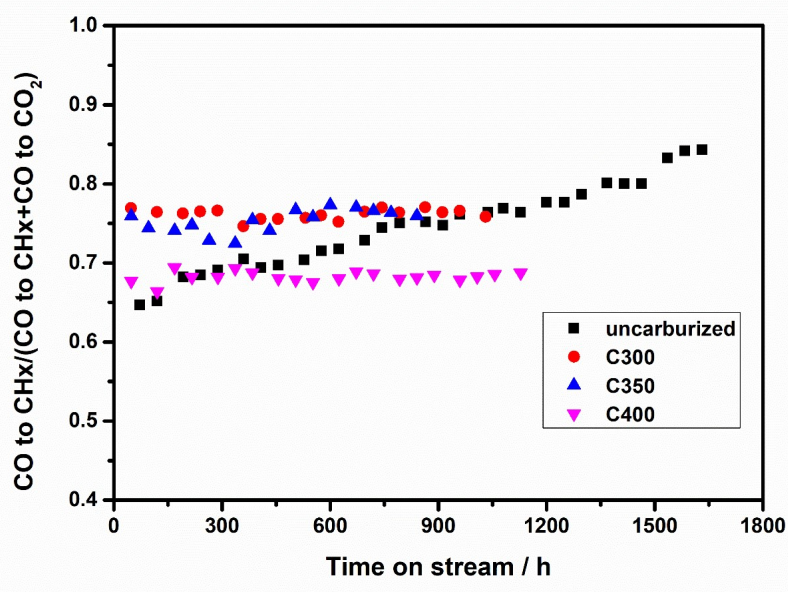

Fig. S2. A correlation curve for the converted CO to hydrocarbons (CHx) per the total consumption of CO versus Time on stream for un-carburized and carburized catalysts.

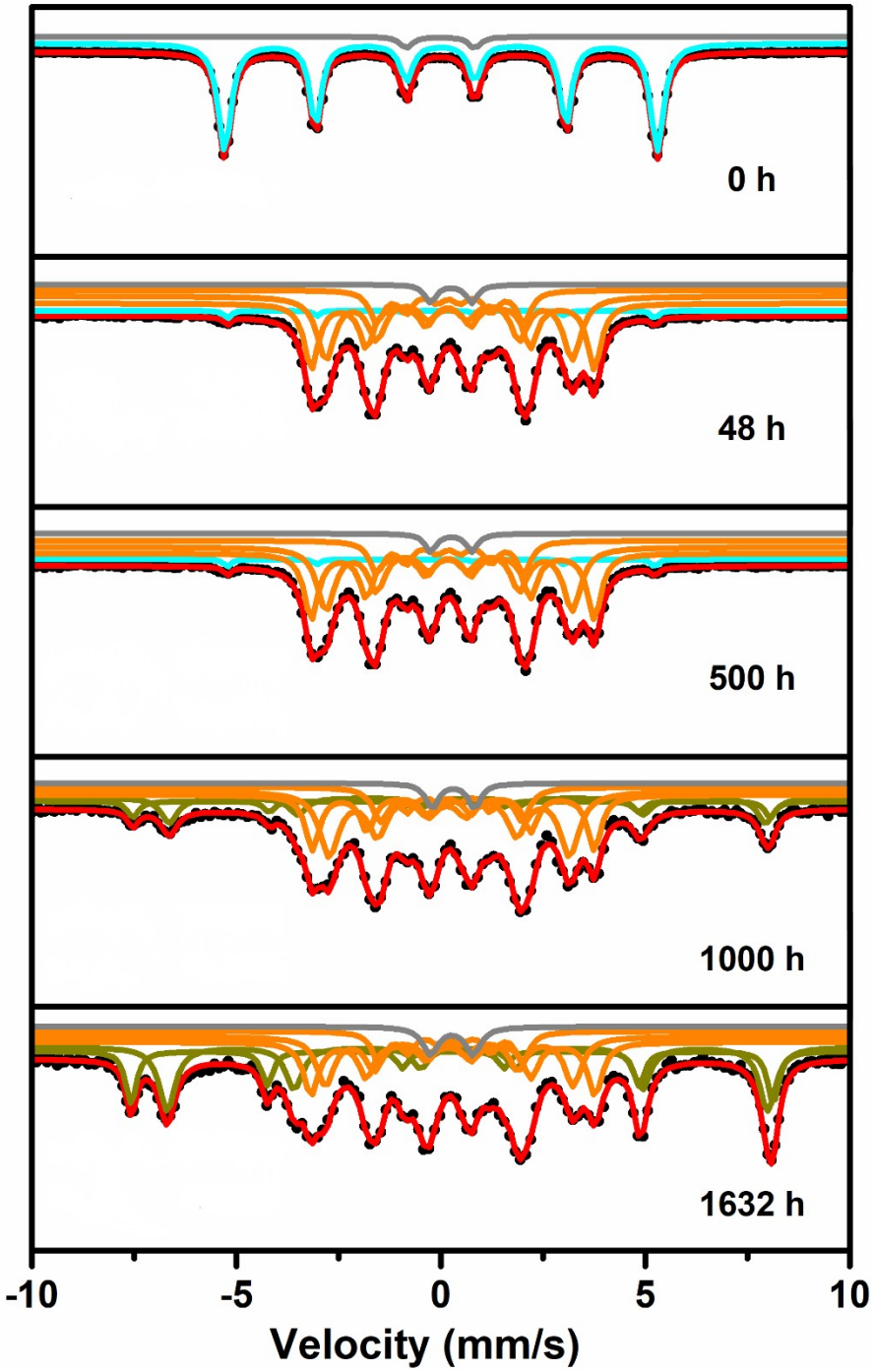

Fig. S3. Mössbauer spectrum of uncarburized sample at different duration of reactions.

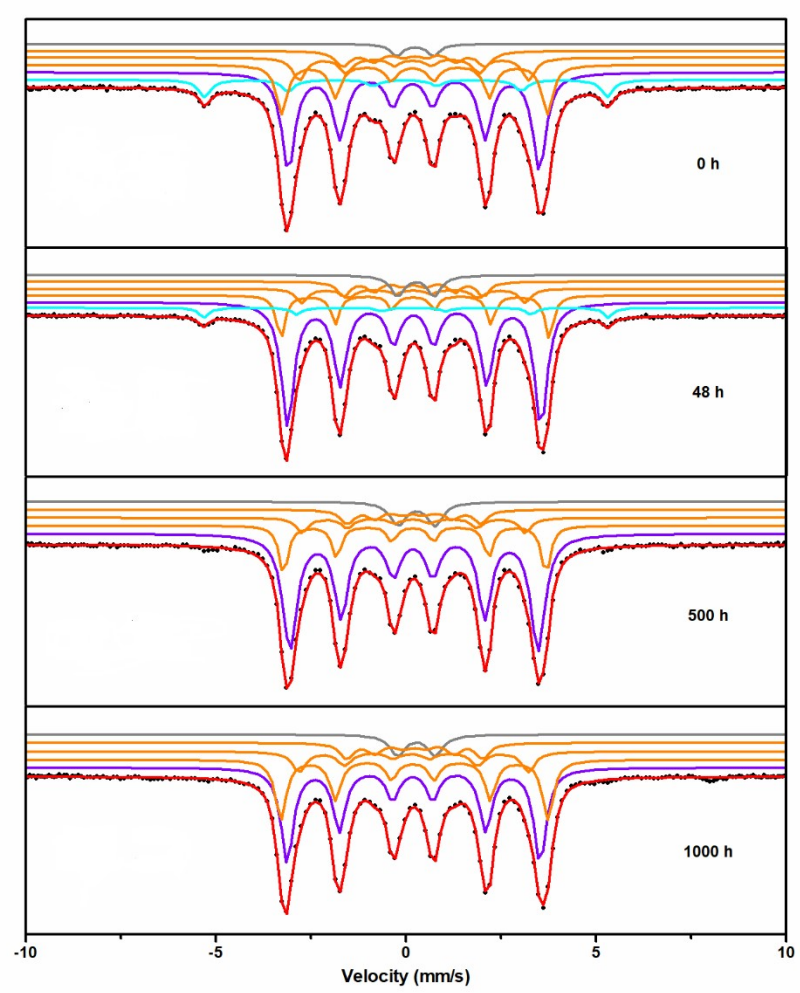

Fig. S4. Mössbauer spectrum of C300 sample at different duration of reactions.

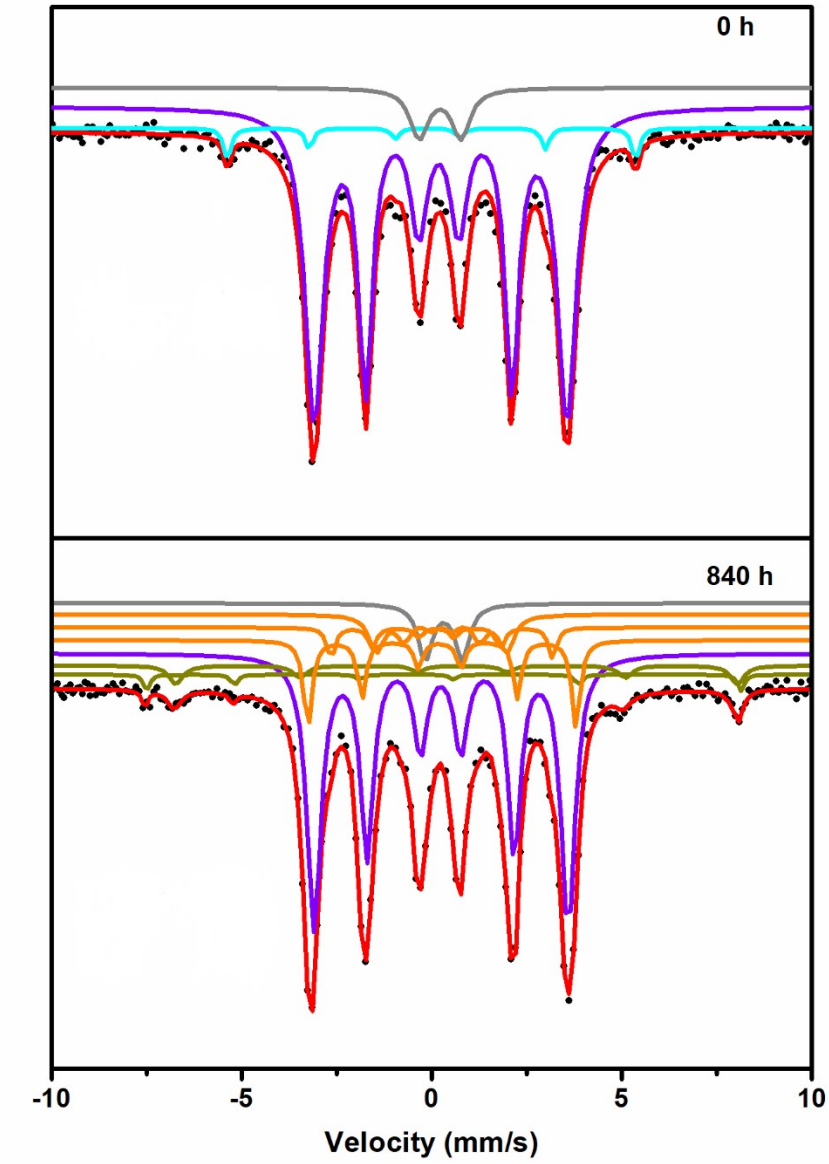

Fig. S5. Mössbauer spectrum of C350 sample at different duration of reactions.

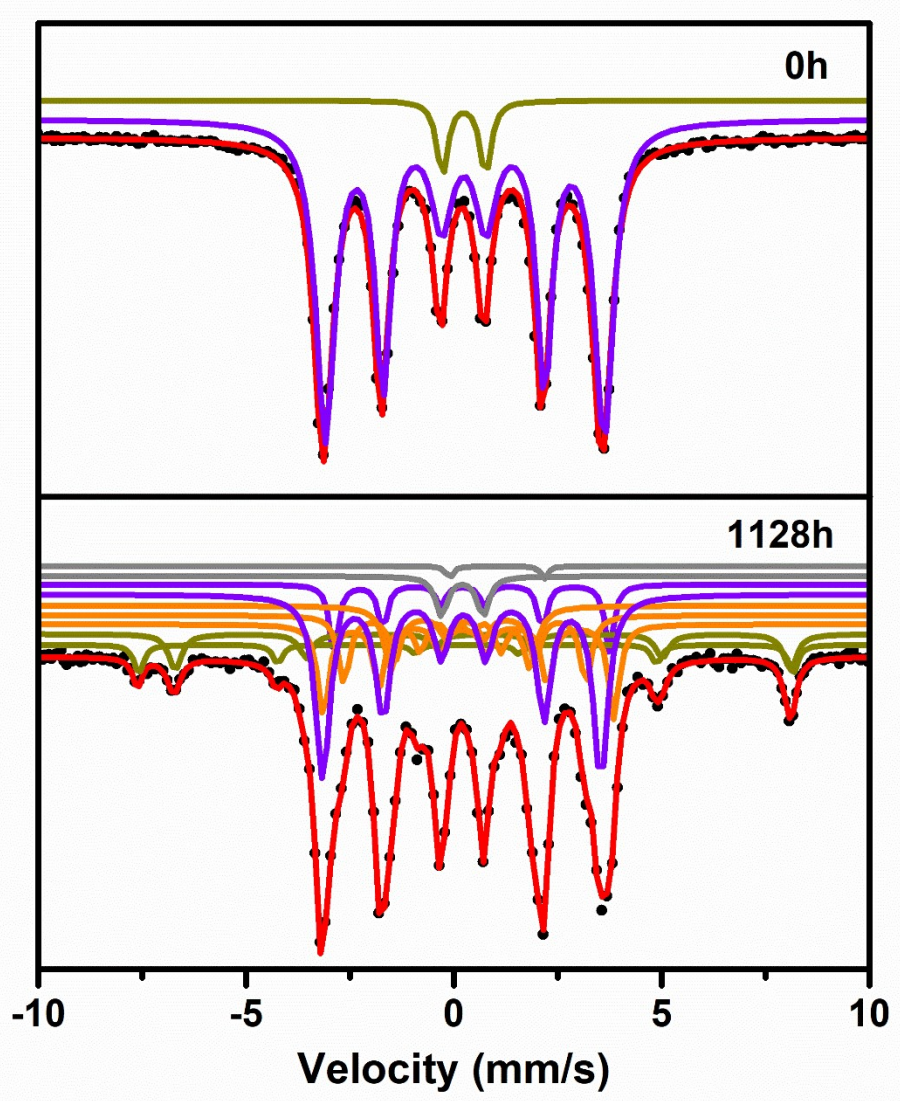

Fig. S6. Mössbauer spectrum of carburized at 400℃ sample at different duration of reactions.

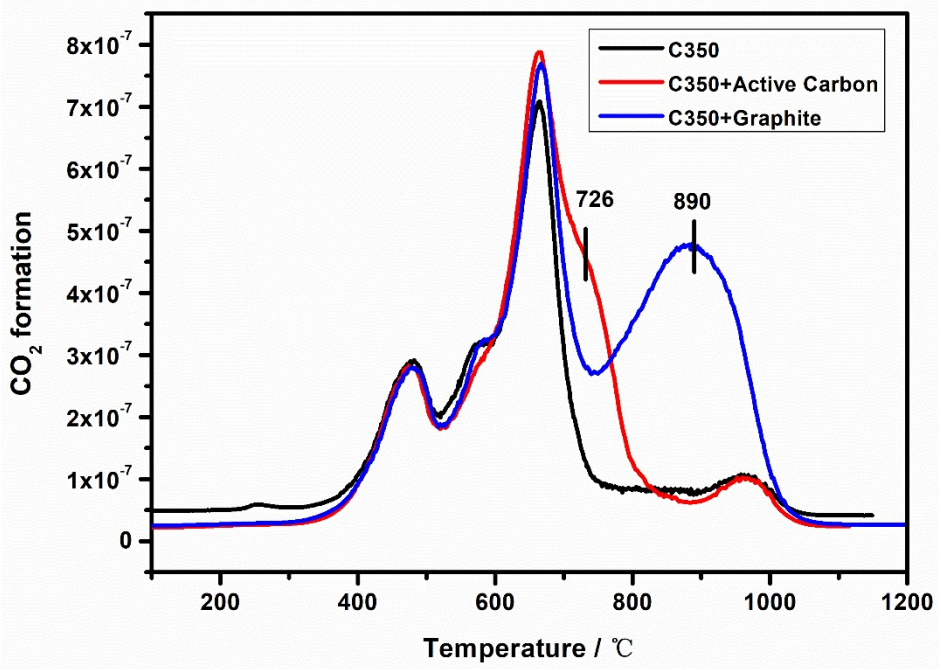

Fig. S7. TPO curves of calibration experiment

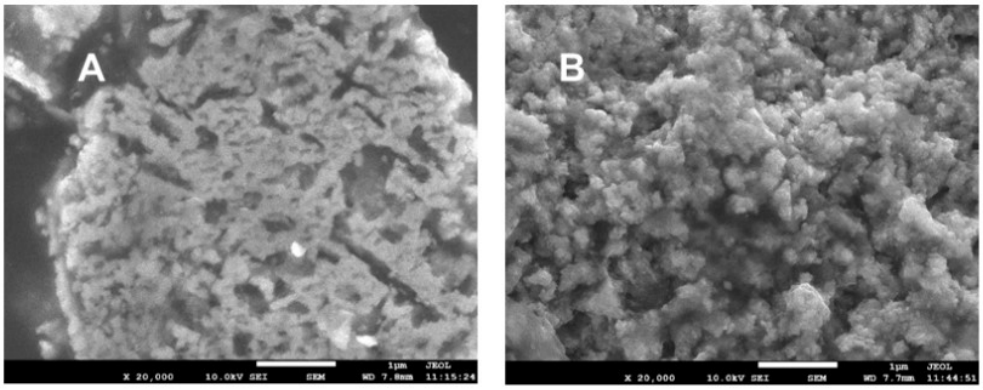

Fig. S8. SEM images of spent/un-carburized sample. (A after 48h for FTS, B after 500h for FTS)

Table S1

Carbonaceous amount quantified by Mössbauer spectrum and TPO.

Sample	Carbon species weight ratio /%			
	Total C % by TPO	C in FexC by Mössbauer	Free carbon / %	Free carbon increment
Uncarburized-1632h	13.56	4.13	9.43	9.43
C300-1000h	12.62	6.80	5.82	5.82
C350-0h	9.60	6.09	3.51	
C350-840h	17.00	6.15	10.85	7.34
C400-0h	20.16	6.24	13.92	
C400-1128h	14.39	5.12	9.27	-4.65