

Electronic Supplementary Information

Catalytic conversion of methyl oleate to hydrocarbons: Impact of cobalt oxide species integration in $\text{SiO}_2\text{-Al}_2\text{O}_3$

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Note: This supplementary information contains supplementary figures S1-S13 and supplementary Table S1 and S2

Fig. S1 EDS mapping of Co, O, Si, Al and EDS spectra of 6% cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ catalyst.

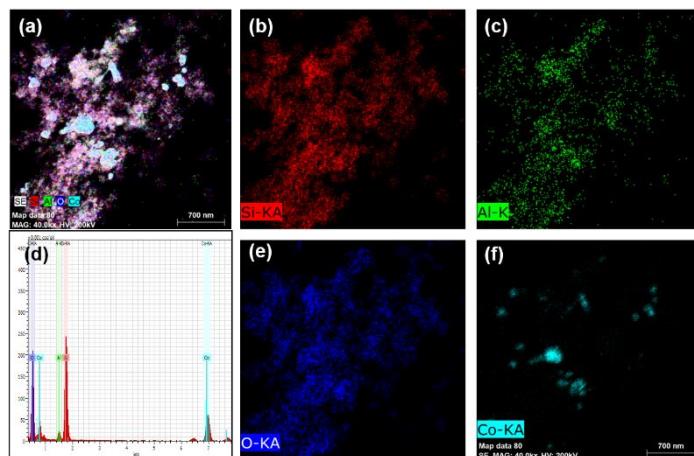


Fig. S2 EDS mapping of Co, O, Si, Al and EDS spectra of 8% cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ catalyst.

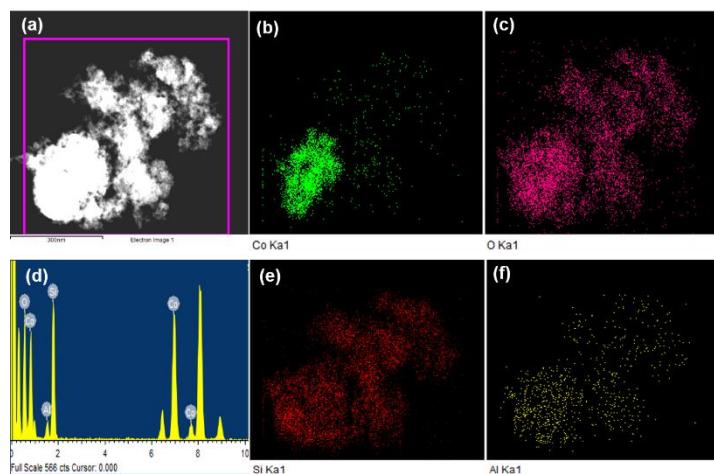


Fig.S3 EDS mapping of Co, O, Si, Al and EDS spectra of 10% cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ catalyst

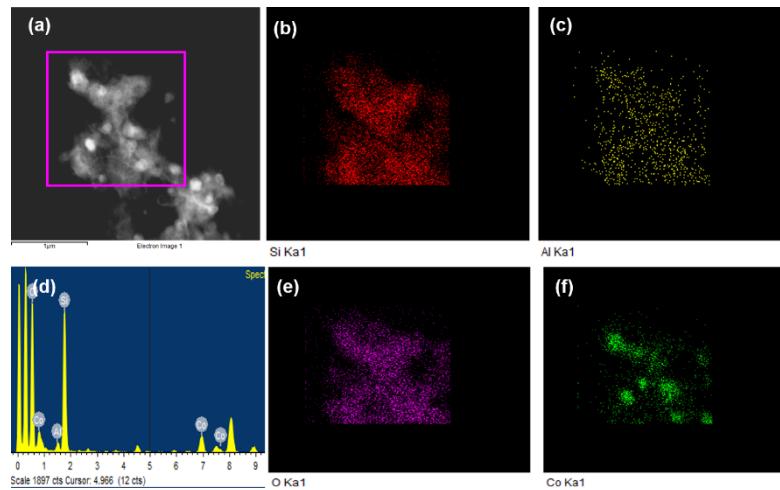


Fig. S4 EDS mapping of Co, O, Si, Al and EDS spectra of 12% cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ catalyst

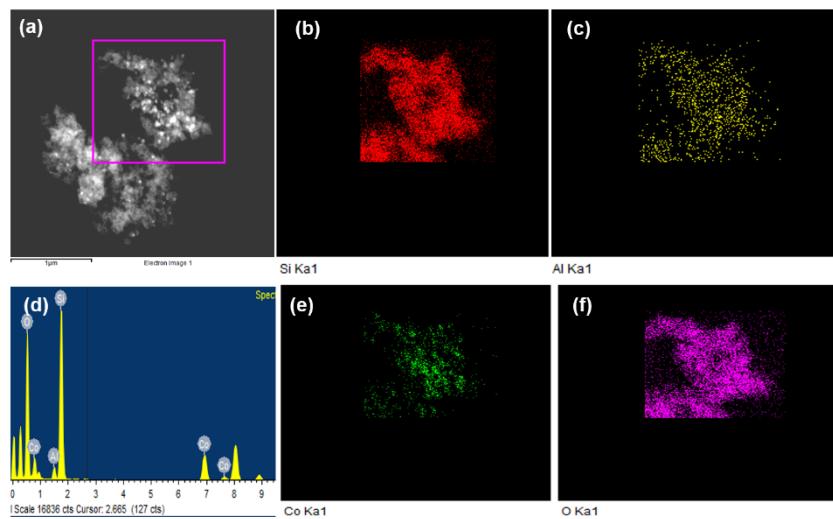


Fig. S5 Pore size distribution of cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ catalyst

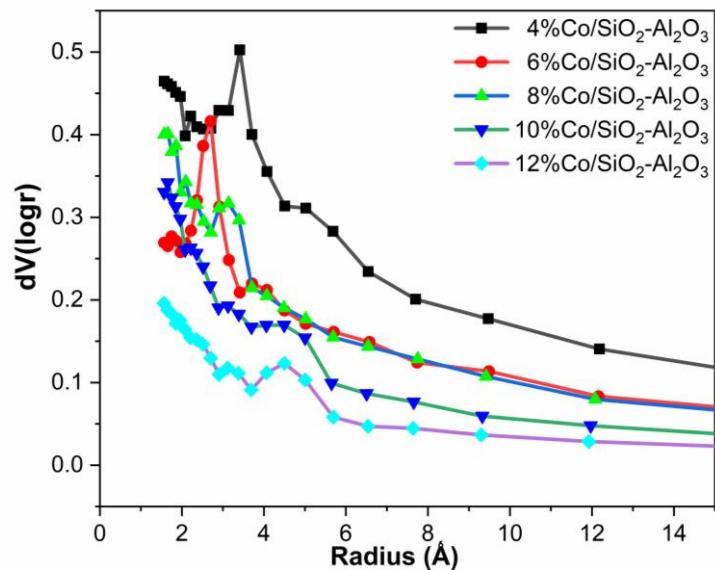


Fig. S6 N_2 adsorption/desorption isotherms and BET adsorption plot of the catalysts

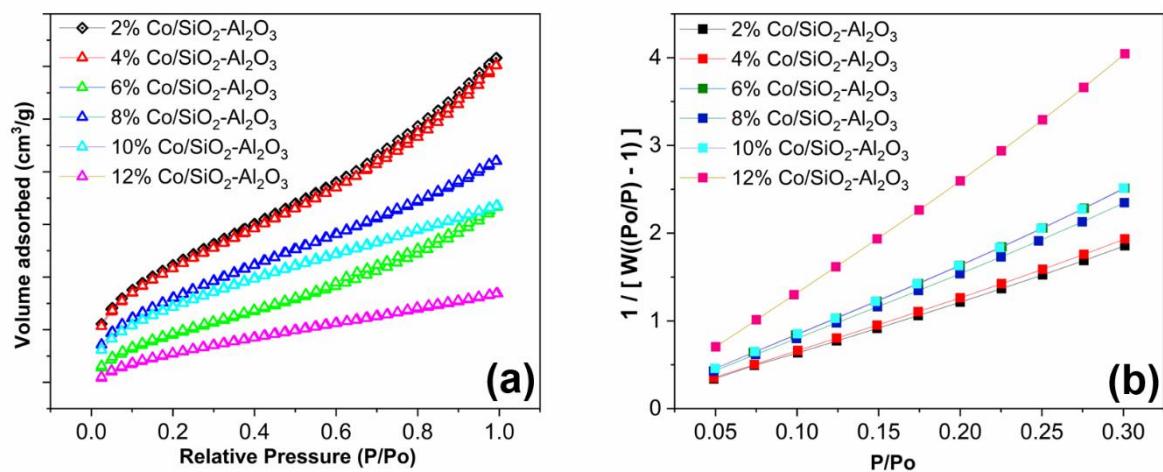


Fig. S7 XPS survey spectra of 6% cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ catalyst

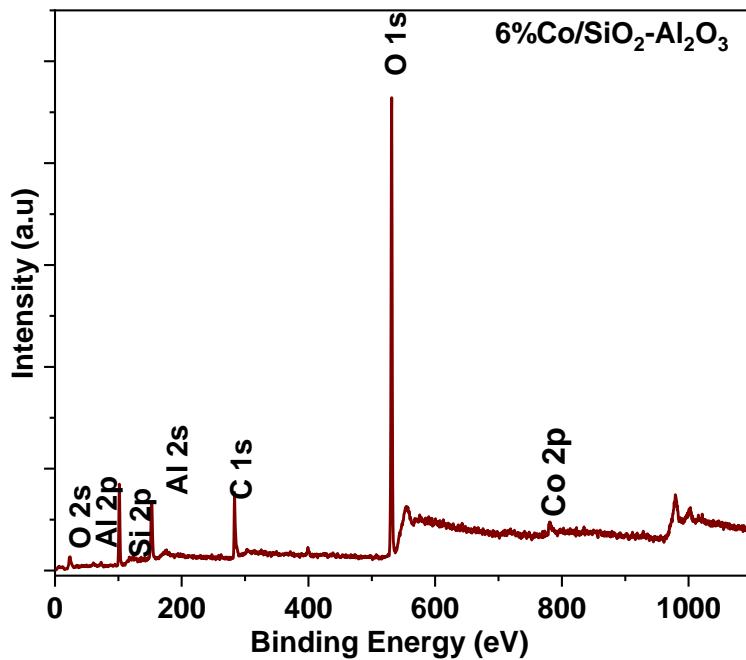


Fig.S8 Ammonia-TPD graphs of cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ catalyst

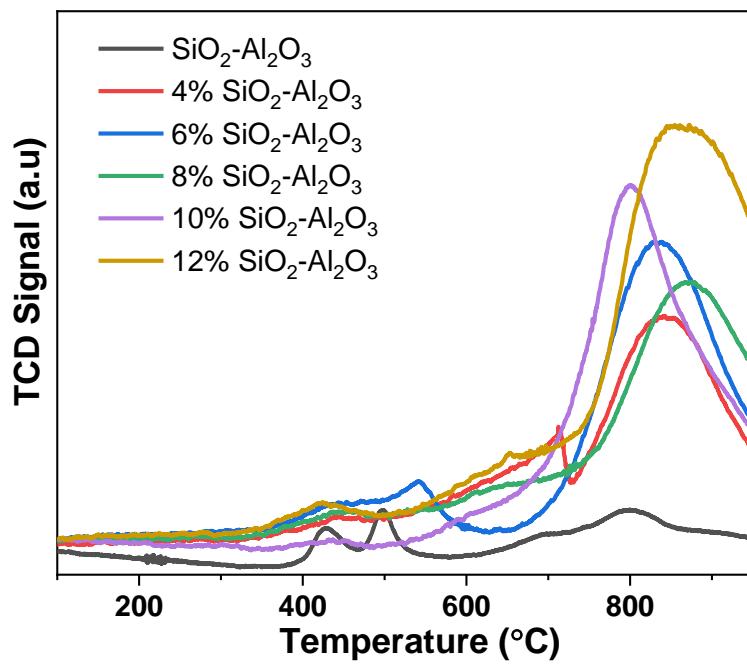


Fig. S9 Solid-state NMR spectra of cobalt oxide/SiO₂-Al₂O₃ catalyst

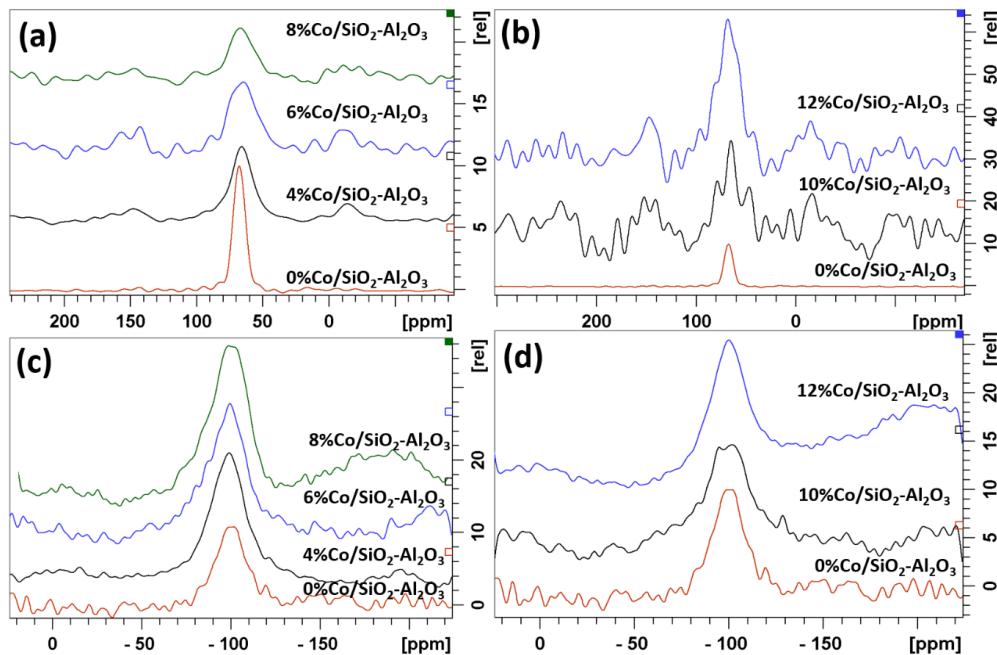


Fig.S10 FT-IR spectra of cobalt oxide/SiO₂-Al₂O₃ catalyst.

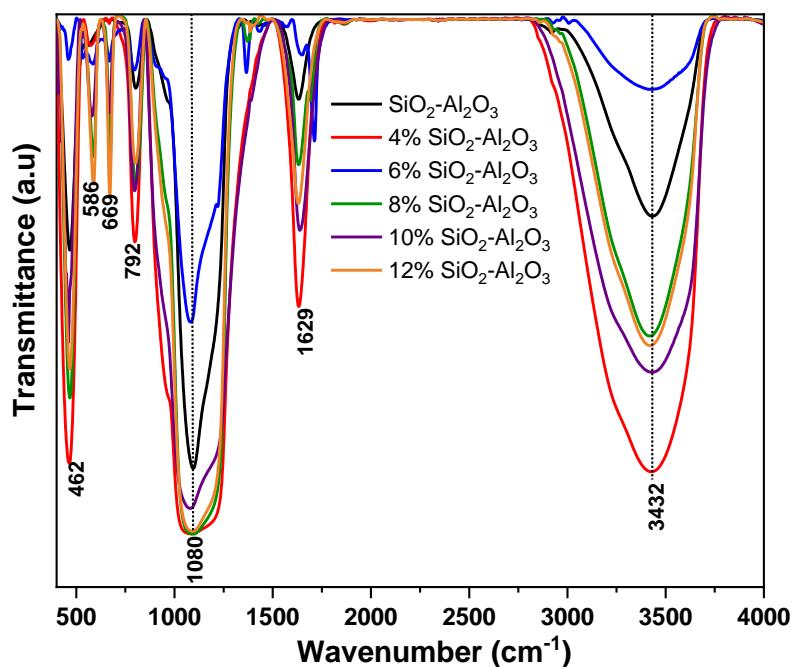


Fig. S11 XRD Spectra of 6% cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ spent catalyst for one, five and ten cycles

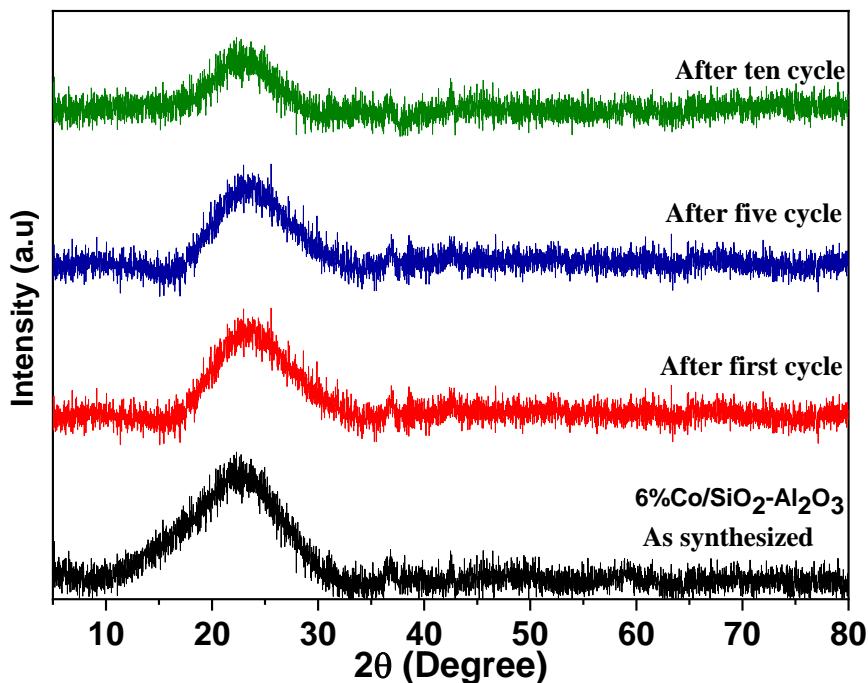


Fig. S12. N₂ adsorption/desorption isotherms of 6% cobalt oxide/ $\text{SiO}_2\text{-Al}_2\text{O}_3$ spent catalyst for one, five and ten cycles.

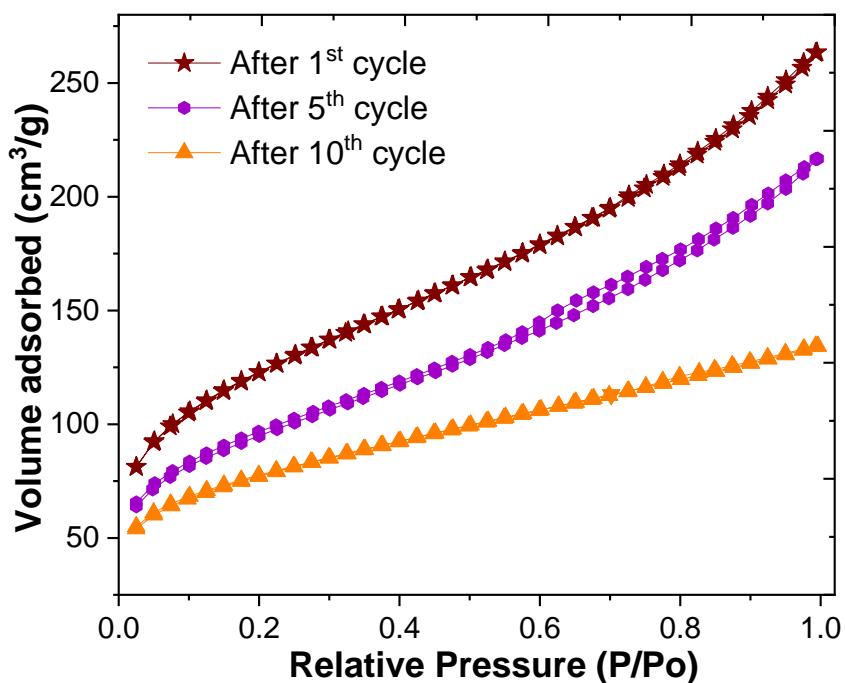


Fig. S13. The Survey and core XPS spectra of spent catalyst

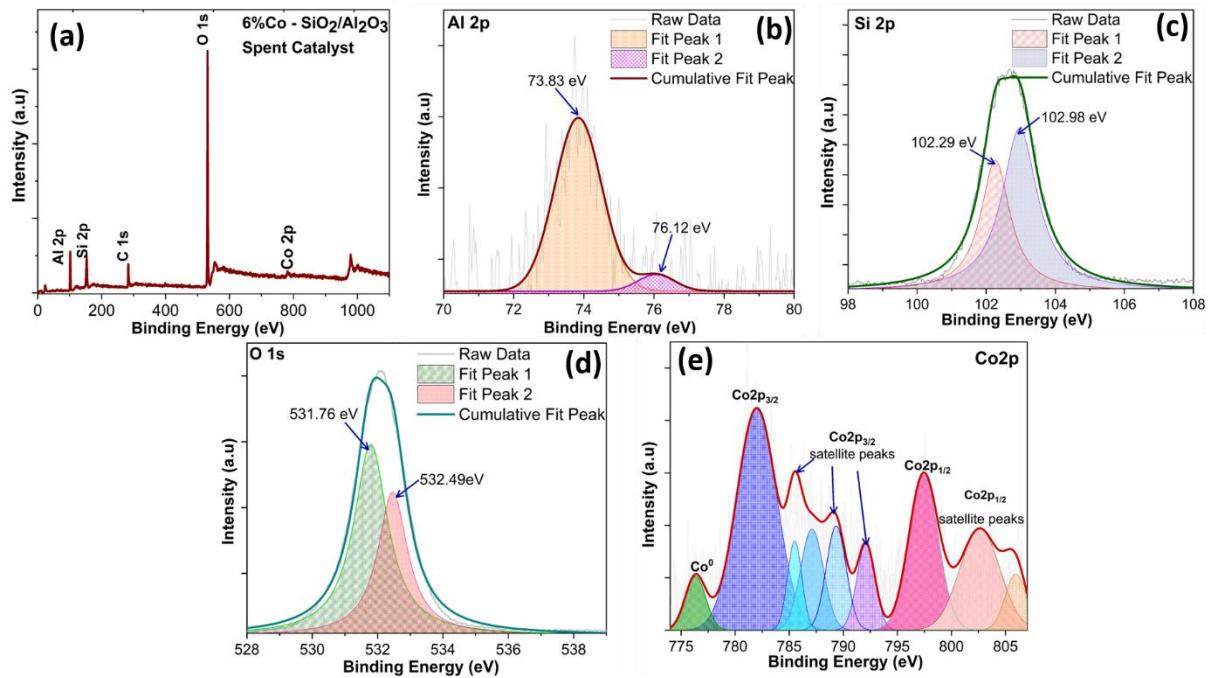


Table S1

Table S1. Reusability test results of 6%Co SiO₂-Al₂O₃ catalyst

No	Cycles	Conversion	Selectivity (%)	
			n-C-17	n-C-18
1	1	100	45	47
2	3	99	45	45
3	5	97	43	42
4	10	94	41	40

Reactions were performed with methyl oleate (250 µL) and catalyst (25 mg) at 10-40 bar H₂ pressure

Table S2

Table S2. Selectivity of lower hydrocarbons from the hydrotreatment reaction of methyl oleate with prepared SiO₂-Al₂O₃ catalyst.

No	Catalyst	Experiment	Selectivity							
			<C-10	C-10	C-11	C-12	C-13	C-14	C-15	C-16
1	6%Co/SiO ₂ -Al ₂ O ₃	280°C/40 bar/10hrs	-	2	13	16	17	17	14	10
2	6%Co/SiO ₂ -Al ₂ O ₃	280°C/30 bar/10hrs	-	0.5	0.5	2	1	1	2	5
3	6%Co/SiO ₂ -Al ₂ O ₃	280°C/20 bar/10hrs	-	-	-	-	3	1	2	8
4	4%Co/SiO ₂ -Al ₂ O ₃	280°C/20 bar/10hrs	66	31	3	-	-	-	-	-
5	SiO ₂ -Al ₂ O ₃	280°C/15 bar/10hrs	-	-	-	2	12	16	13	-