The oxidative dehydrogenation of propane on series of cobalt BEA zeolite catalysts prepared by post-synthesis methods, Part I: Catalyst synthesis and characterization

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Figures: 6

Tables: 1

Keywords: BEA, zeolite, cobalt, DR UV-vis, NMR, XPS

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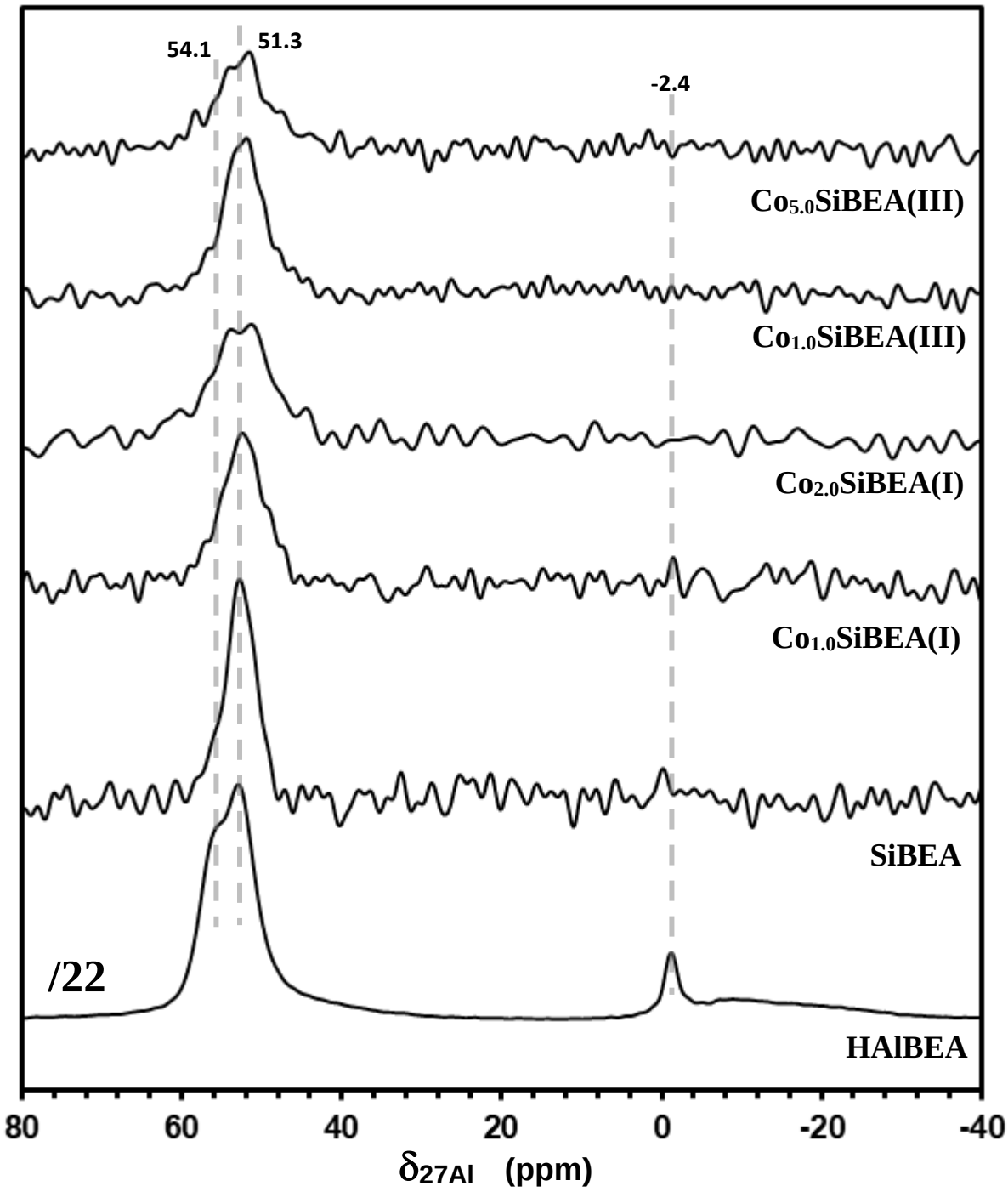

Figure S1. ^{27}Al MAS NMR of HAlBEA, SiBEA, $Co_{1.0}$SiBEA(I), $Co_{2.0}$SiBEA(I) $Co_{1.0}$SiBEA(III) and $Co_{5.0}$SiBEA(III).

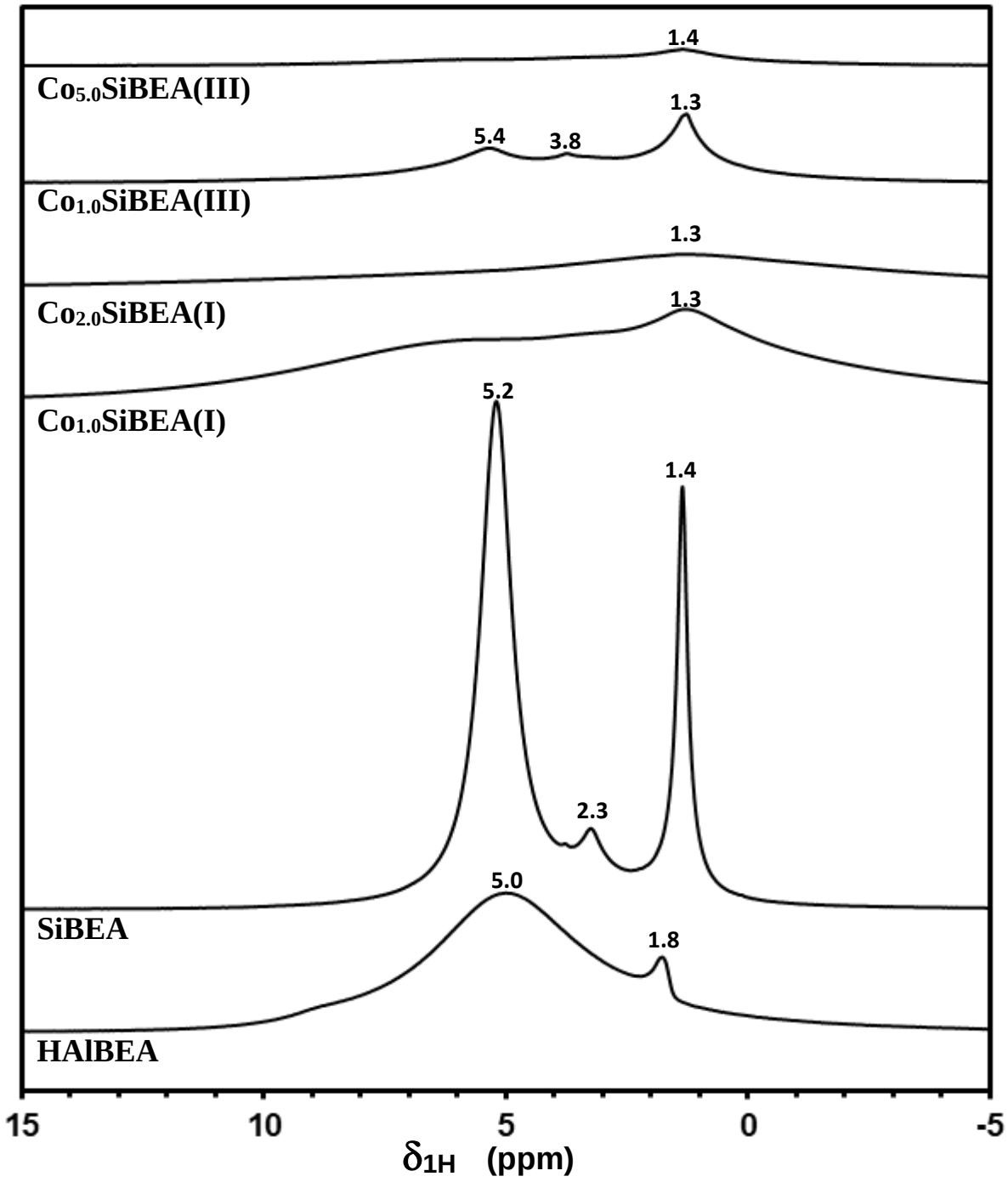

Figure S2. ^{1}H MAS NMR of HAlBEA, SiBEA, $Co_{1.0}$SiBEA(I), $Co_{2.0}$SiBEA(I), $Co_{1.0}$SiBEA(III) and $Co_{5.0}$SiBEA(III).

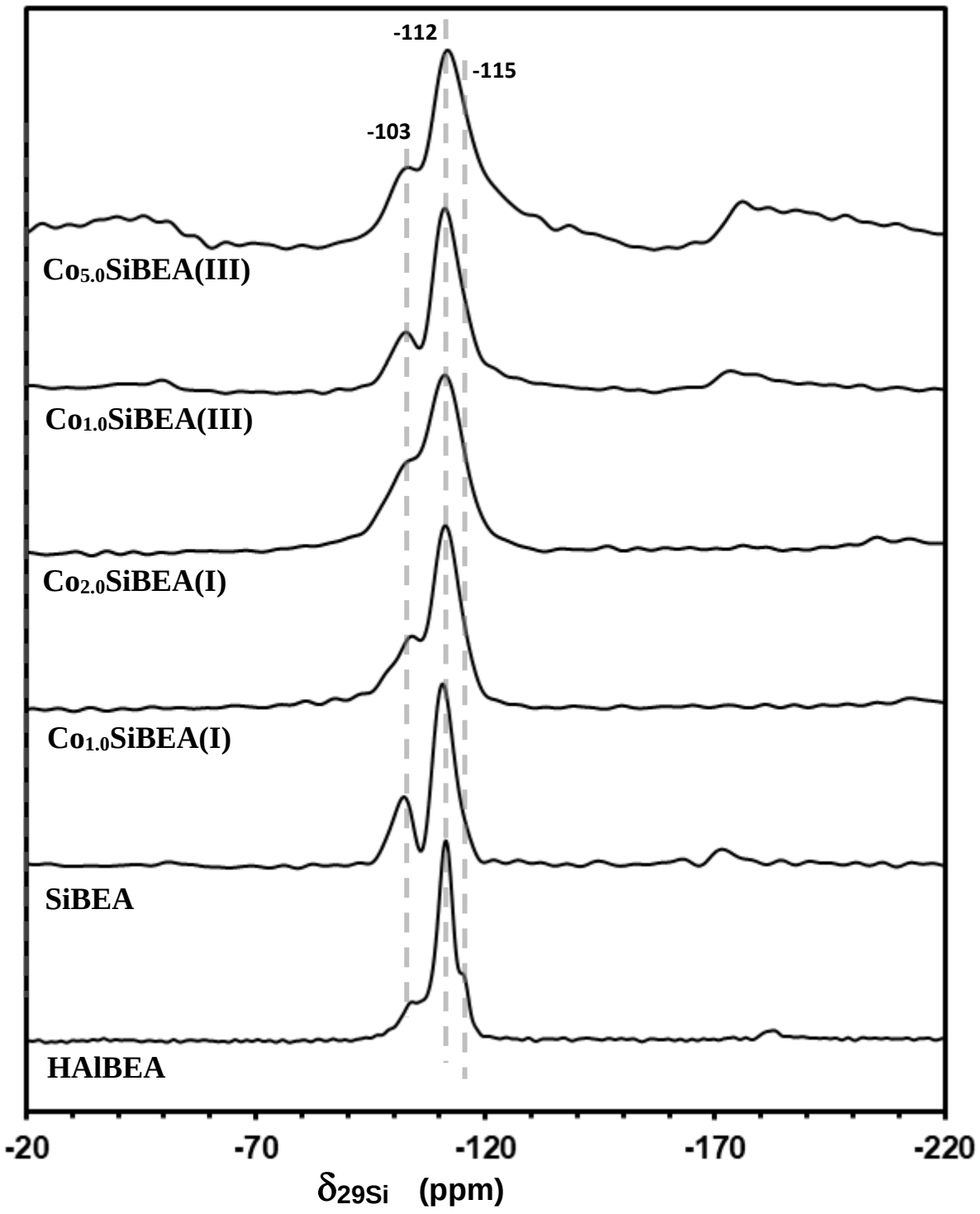

Figure S3. ^{29}Si MAS NMR of HAlBEA, SiBEA, $Co_{1.0}$SiBEA(I), $Co_{2.0}$SiBEA(I), $Co_{1.0}$SiBEA(III) and $Co_{5.0}$SiBEA(III).

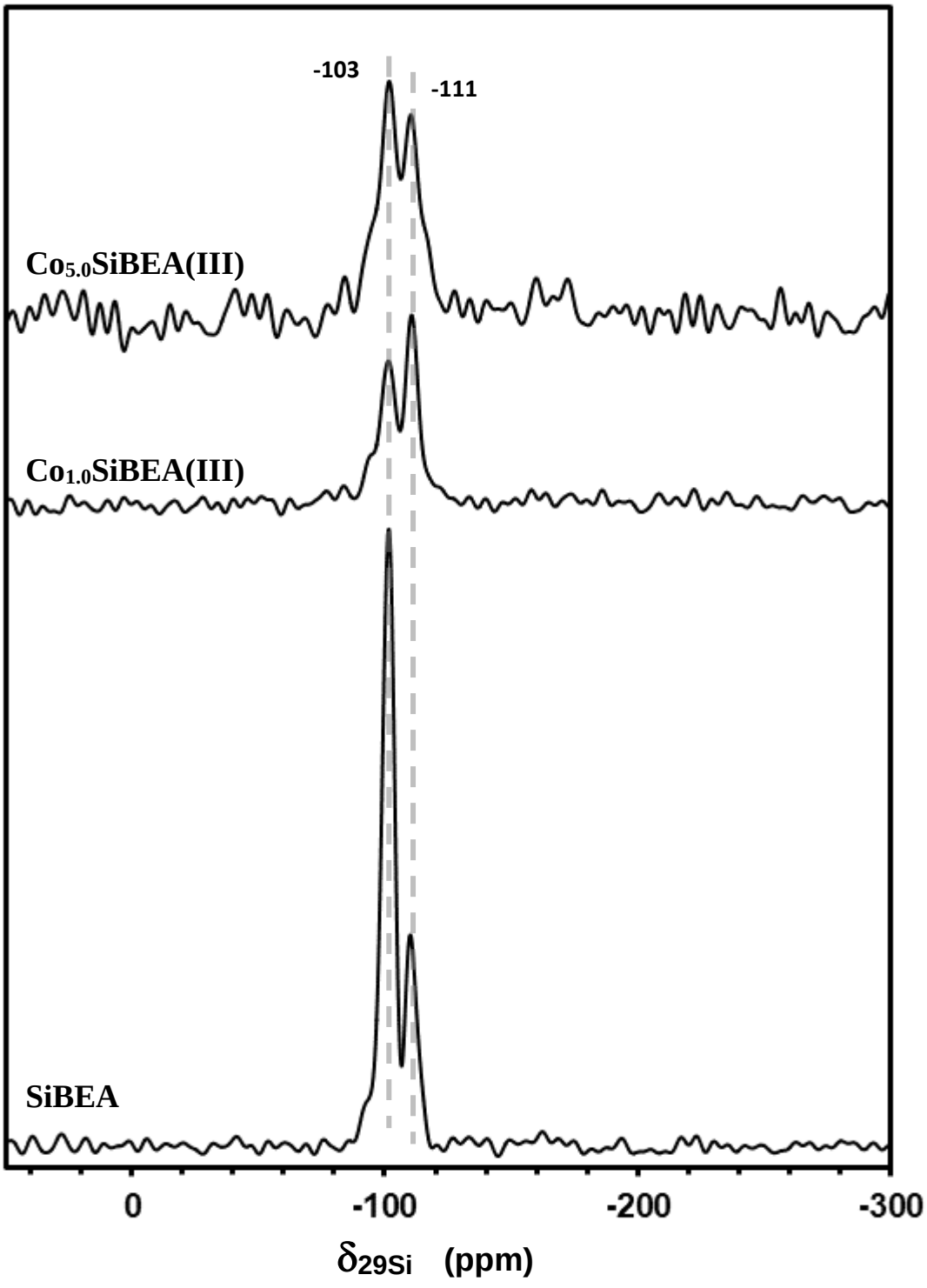

Figure S4. ^{1}H - ^{29}Si CP MAS NMR of SiBEA, $Co_{1.0}$SiBEA(III) and $Co_{5.0}$SiBEA(III).

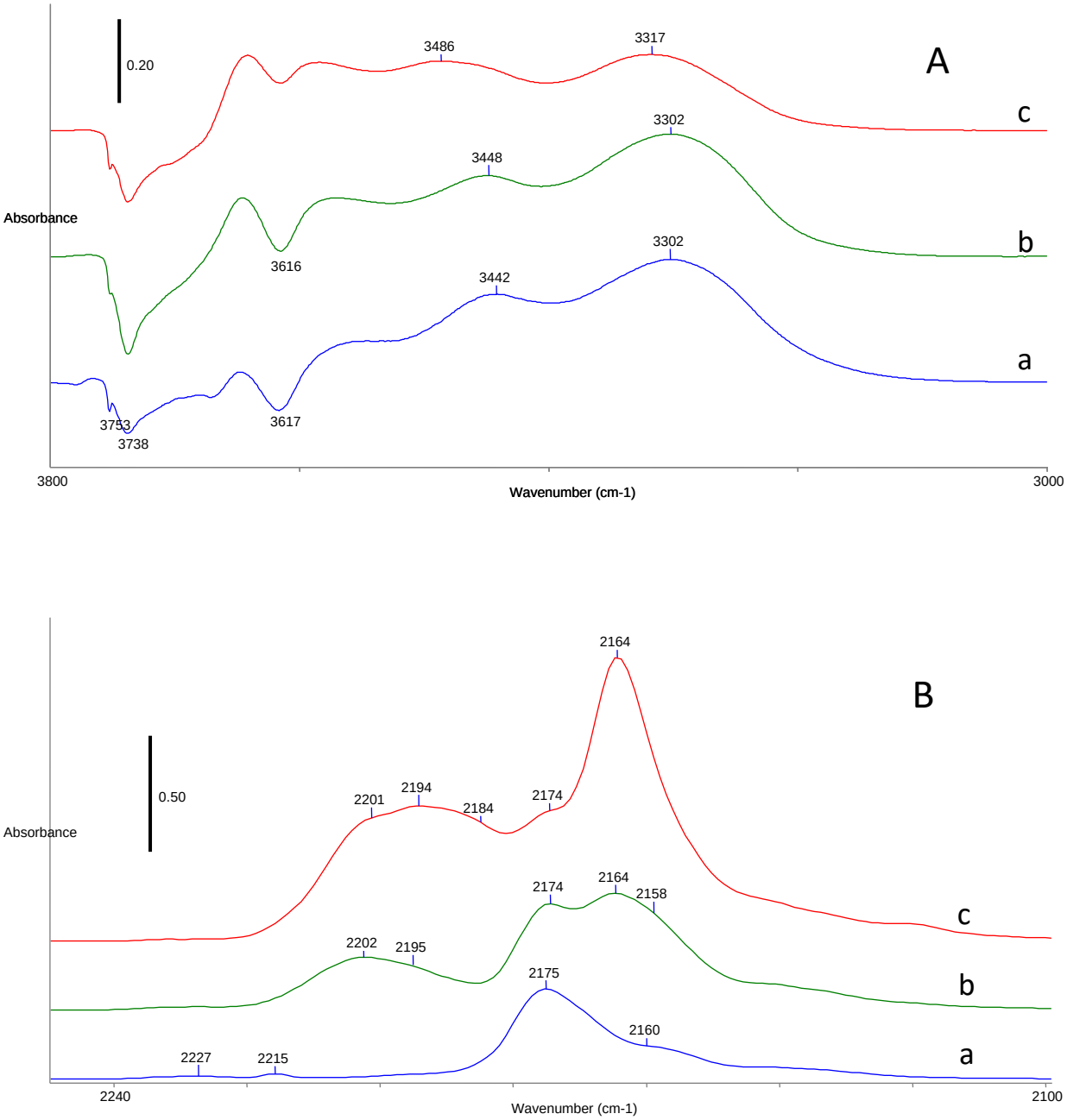

Figure S5. FTIR difference spectra in hydroxyl (A) and carbonyl (B) stretching range of HAlBEA (a), $Co_{1.0}$HAlBEA(II) (b) and $Co_{5.0}$HAlBEA(II) (c) after CO adsorption at 173°C with equilibrium pressure 133 Pa of CO and secondary vacuum evacuation for 5 minutes (pressure < 5×10^{-2} Pa)

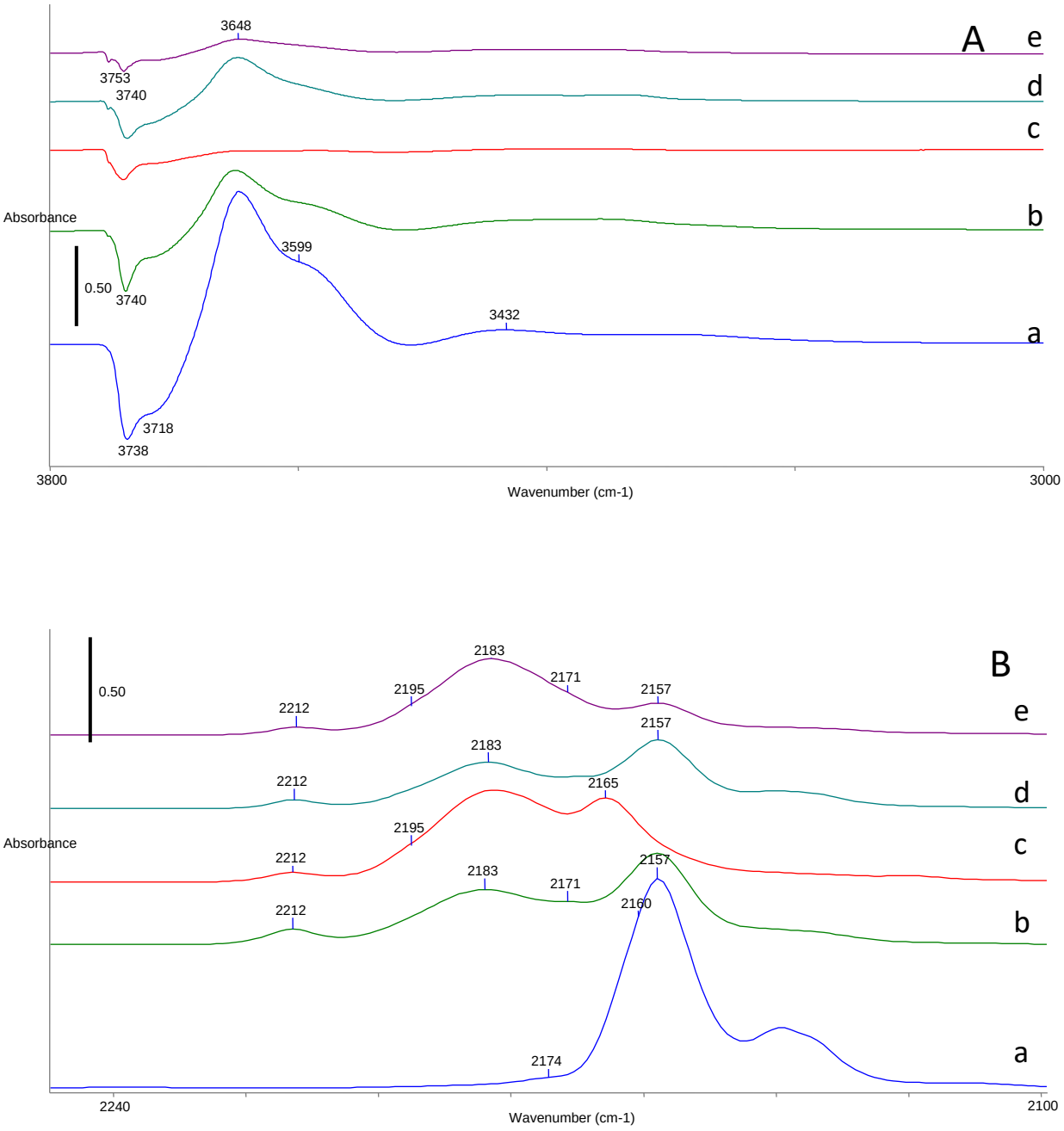

Figure S6. FTIR difference spectra in hydroxyl (A) and carbonyl (B) stretching range of SiBEA (a), $Co_{1.0}$SiBEA(I) (b), $Co_{5.0}$SiBEA(I) (c), $Co_{1.0}$SiBEA(III) (d) and $Co_{5.0}$SiBEA(III) (e) after CO adsorption at 173°C with equilibrium pressure 133 Pa of CO and secondary vacuum evacuation for 5 minutes (pressure < 5×10^{-2} Pa)

Table S1. XPS O 1s data of catalysts with pH = 2.5 (upper part) and pH = 3.0-9.0 (lower part)

Sample	A		B		C	
	BE (eV)	Area (%)	BE (eV)	Area (%)	BE (eV)	Area (%)
AP-$Co_{3.0}$SiBEA(I)	531.4	3.6	533.5	87.1	534.4	9.3
AP-$Co_{5.0}$SiBEA(I)	531.3	4.4	533.2	90.1	534.8	5.5
AP-$Co_{9.0}$SiBEA(I)	531.6	8.7	533.3	86.8	534.7	4.5
$Co_{9.0}$SiBEA(I)	531.4	7.1	533.6	88.5	534.7	4.4
AP-$Co_{1.0}$SiBEA(III)	531.3	2.7	533.7	94.2	535.7	3.1
AP-$Co_{3.0}$SiBEA(III)	531.8	8.1	533.5	87.7	535.1	4.2
AP-$Co_{5.0}$SiBEA(III)	531.4	7.8	533.4	89.6	535.4	2.6
$Co_{5.0}$SiBEA(III)	531.4	4.5	533.8	89.9	535.1	5.6
$Co_{9.0}$SiBEA(III)	531.3	5.4	533.8	91.0	535.6	3.6