Electronic Supplementary Information

Sulfonated carbons from agro-industrial residues: simple and efficient catalysts for the Biginelli reaction

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1. SEM/EDX analysis

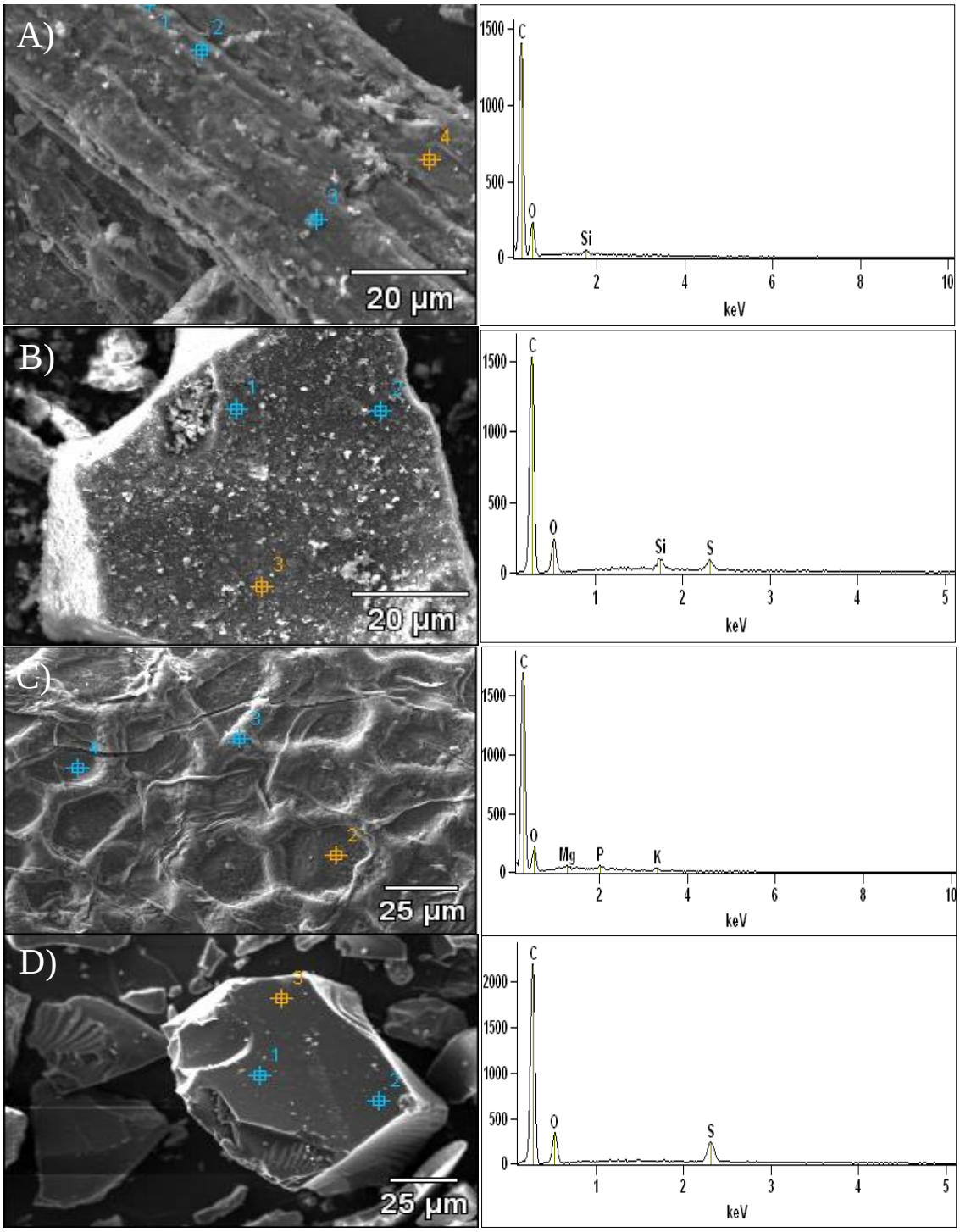


Fig S1. SEM image and EDX spectra of A) rice husk; B) CRH; C) tomato bagasse; and D) CTB.

2. TEM images

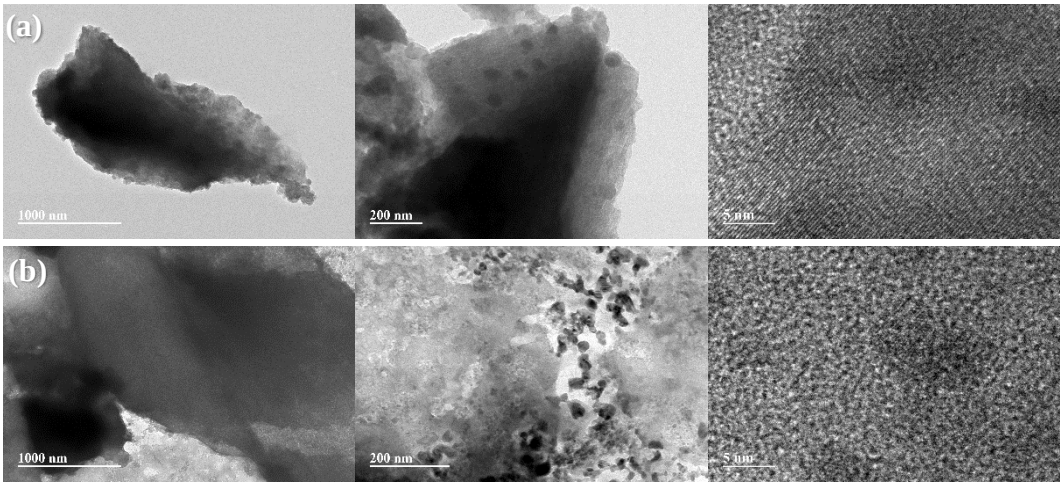


Fig S2. TEM images of (a) rice husk precursor and (b) CRH catalyst.

3. XRD analysis

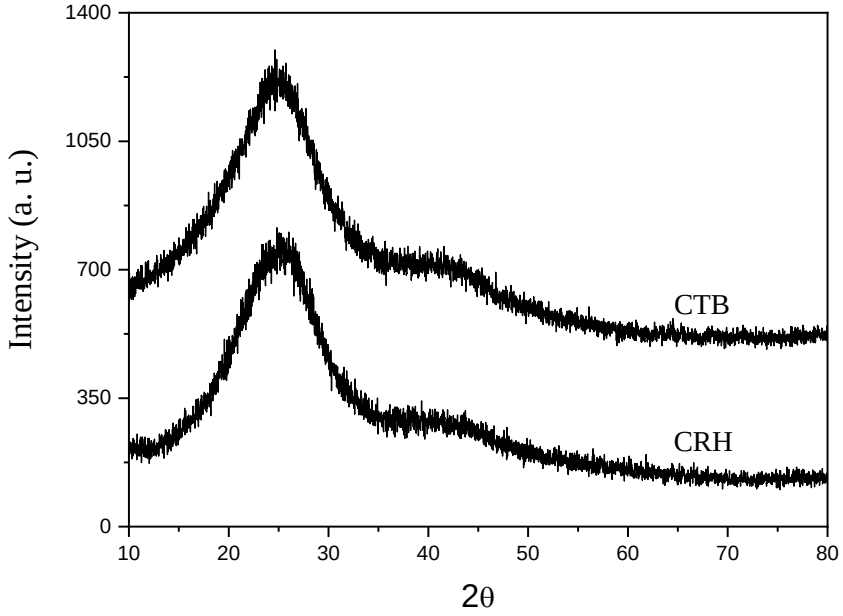
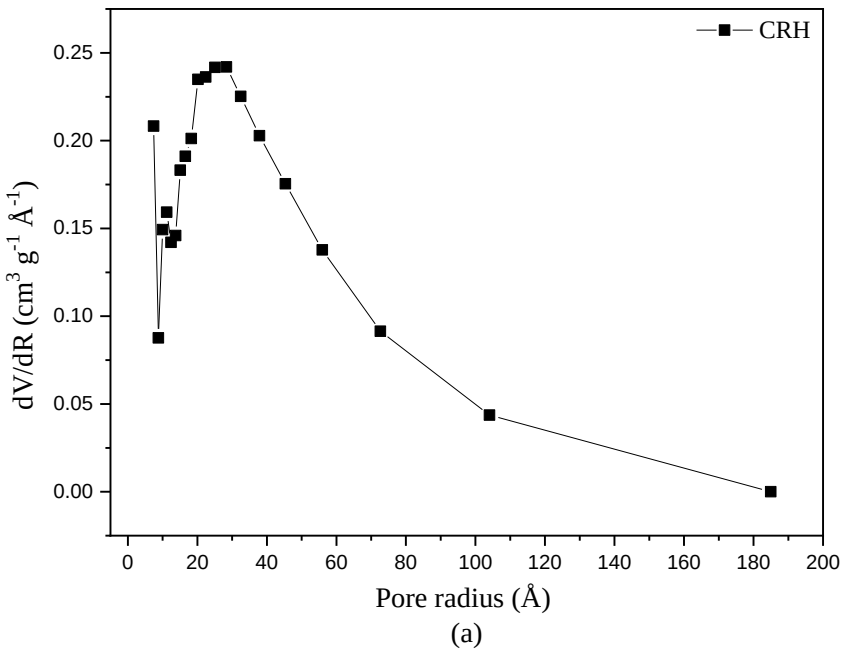
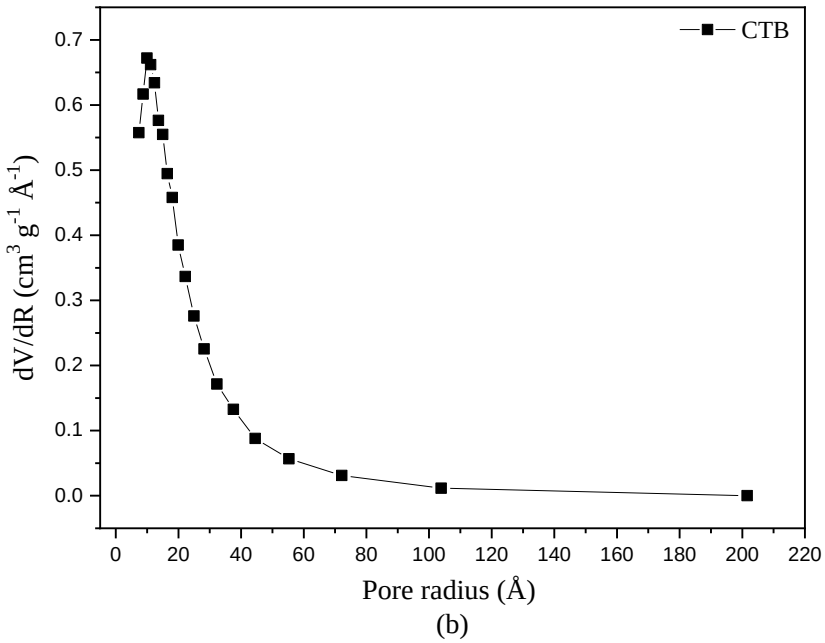


Fig S3. XRD diffractograms of CRH and CTB.

4. Pore size distributions



(a)



(b)

Fig S4 Pore-size distributions of CRH and CTB.

5. Elementary composition by XPS analysis

Table S1 Chemical composition of rice husk and catalyst of rice husk by XPS analysis

Sample	**Elementary concentration (%)***				
	C 1s	**O 1s**	**N 1s**	**Si 2p**	**S 2p**
Rice husk	69.5	23.9	1.5	4.9	0.3
CRH	42.6	40.9	0.9	10.6	4.9

* Values obtained from high resolution spectra with error of ± 5%

6. NMR spectra

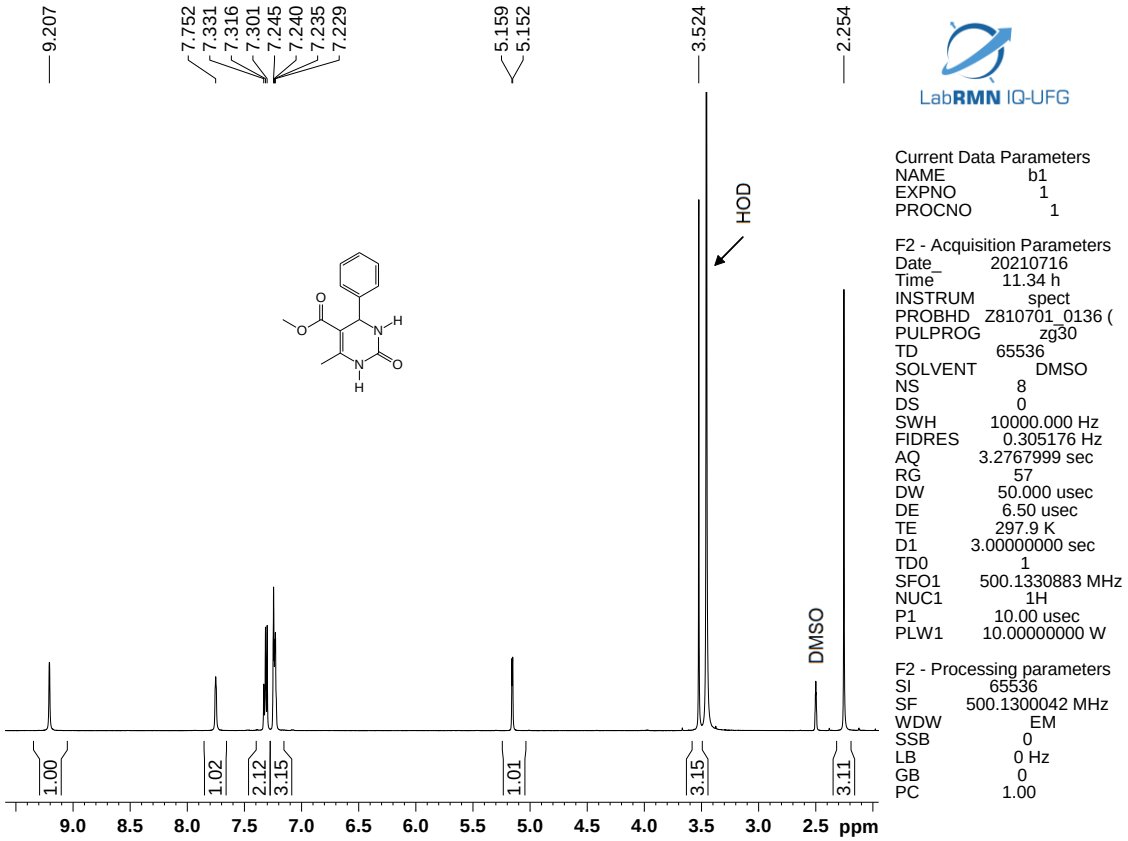


Fig S5 ^{1}H-NMR spectra of product B1 (*5-Methoxycarbonyl-4-phenyl-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

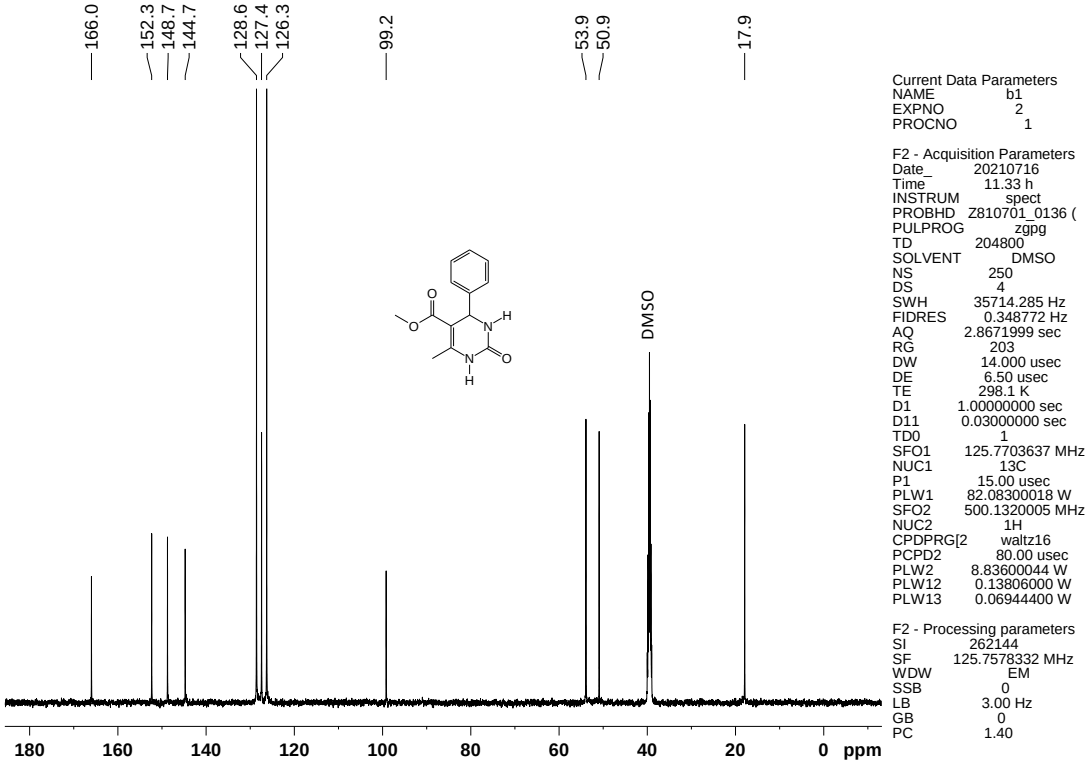


Fig S6 ^{13}C-NMR spectra of product B1 (*5-Methoxycarbonyl-4-phenyl-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

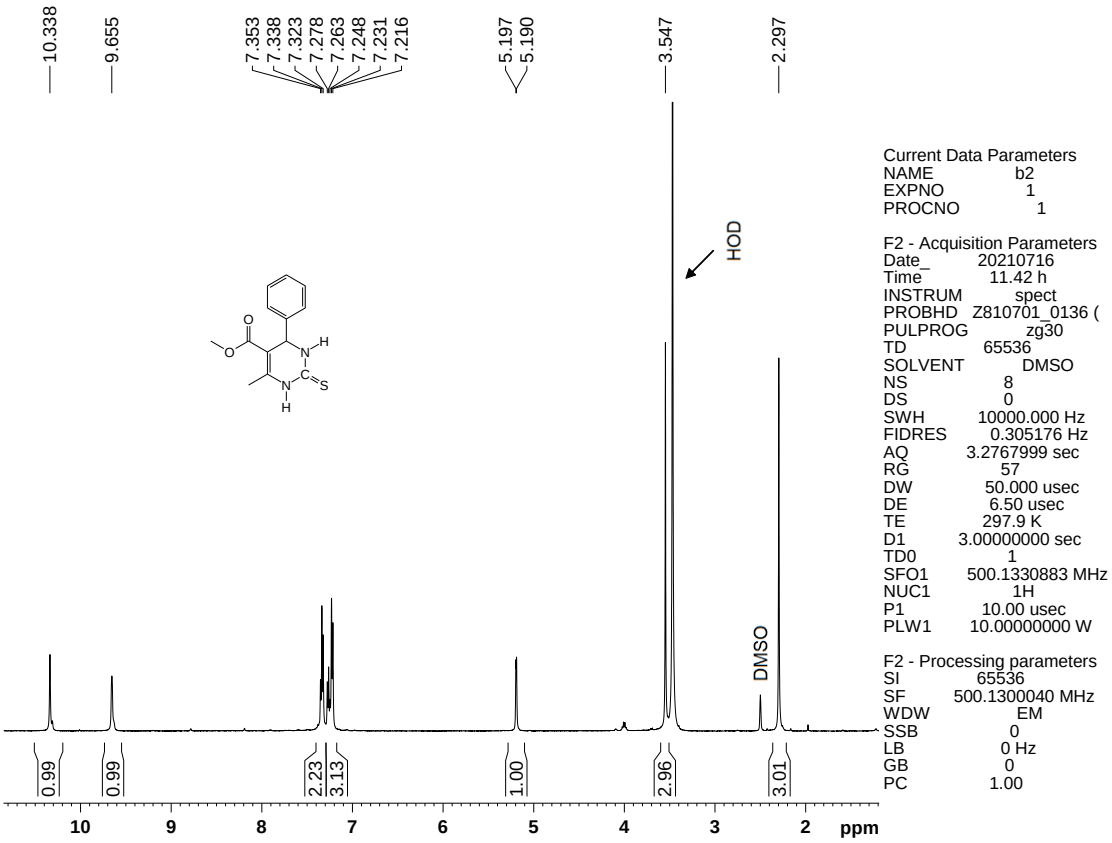


Fig S7 ^{1}H-NMR spectra of product B2 (5-Methoxycarbonyl-4-phenyl-6-methyl-3,4-dihydropyrimidin-2(1-H)-thione).

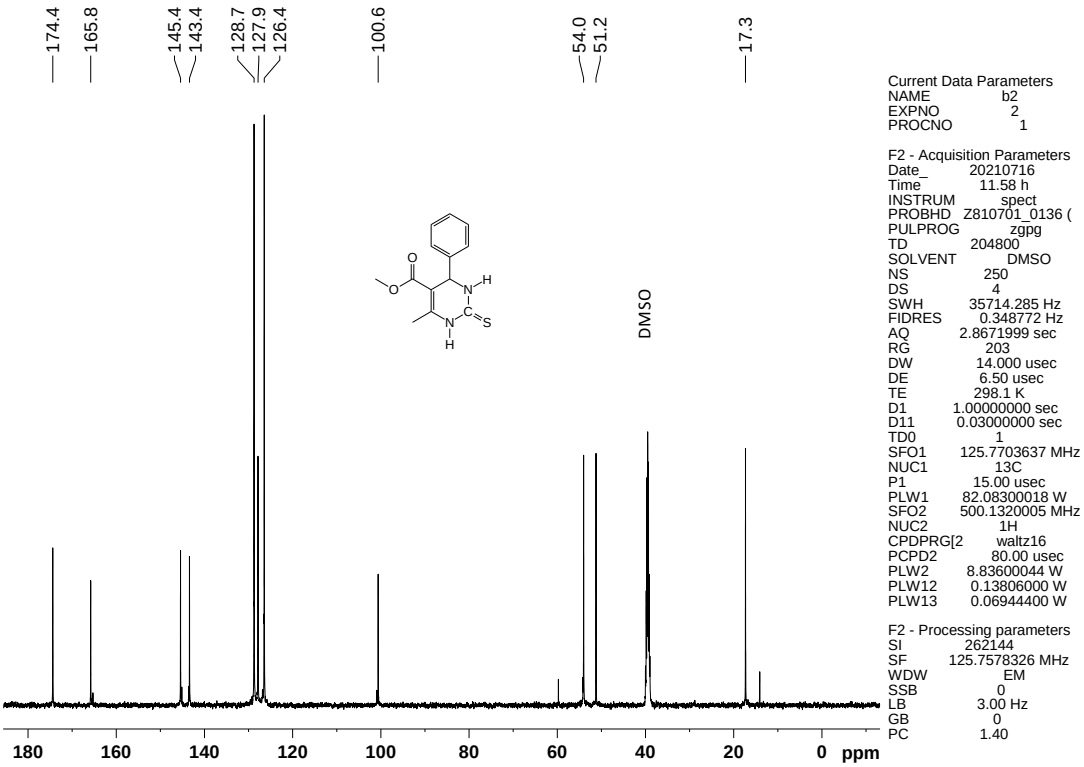


Fig S8 ^{13}C-NMR spectra of product B2 (5-Methoxycarbonyl-4-phenyl-6-methyl-3,4-dihydropyrimidin-2(1-H)-thione).

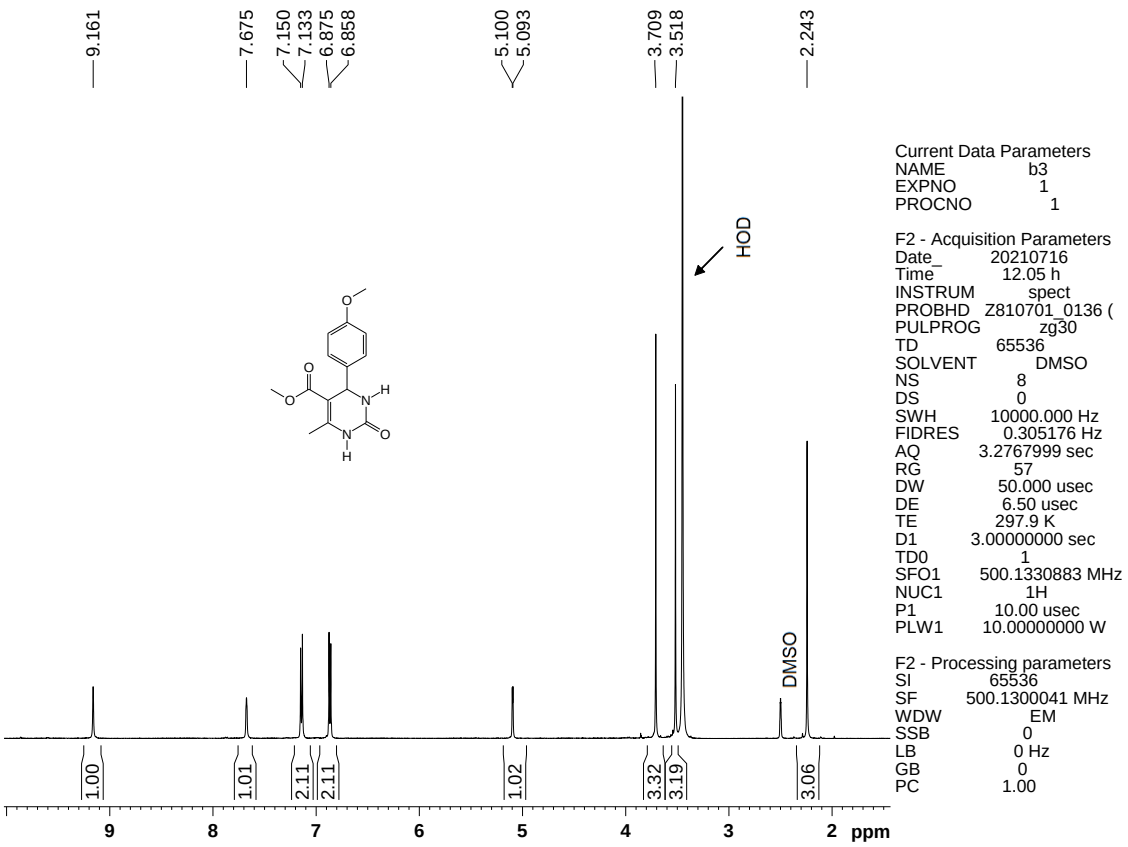


Fig S9 ^{1}H-NMR spectra of product B3 (*5-Methoxycarbonyl-4-(4-methoxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

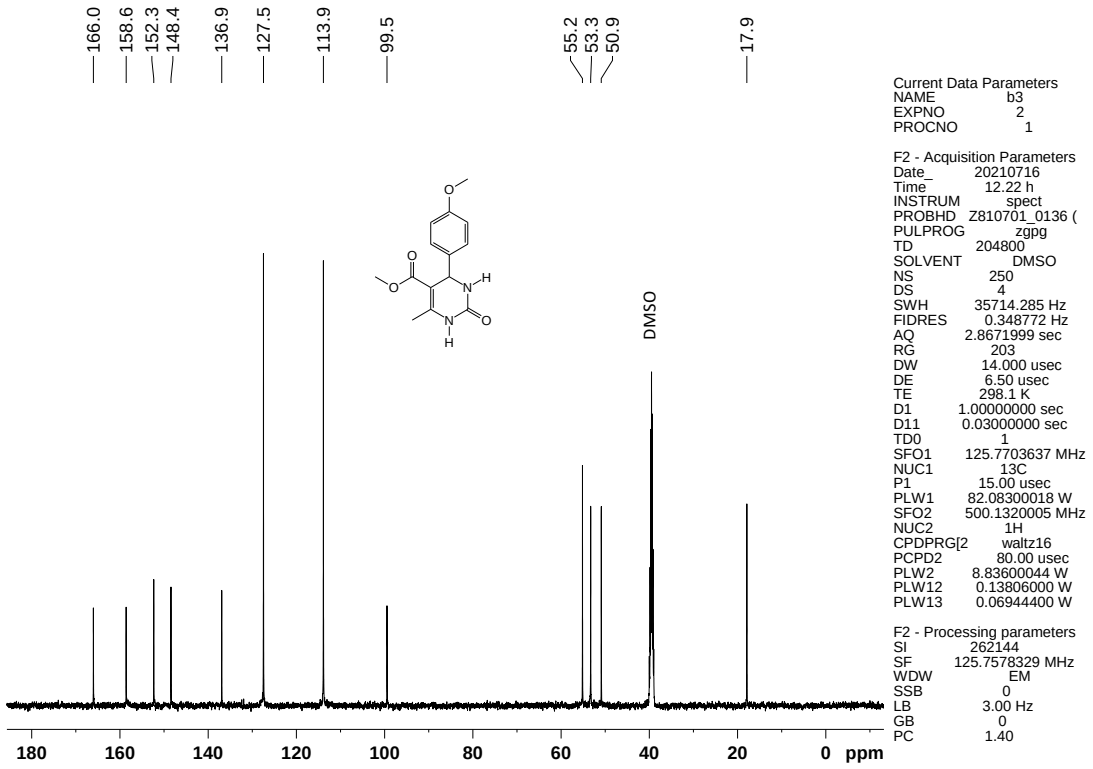


Fig S10 ^{13}C-NMR spectra of product B3 (*5-Methoxycarbonyl-4-(4-methoxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

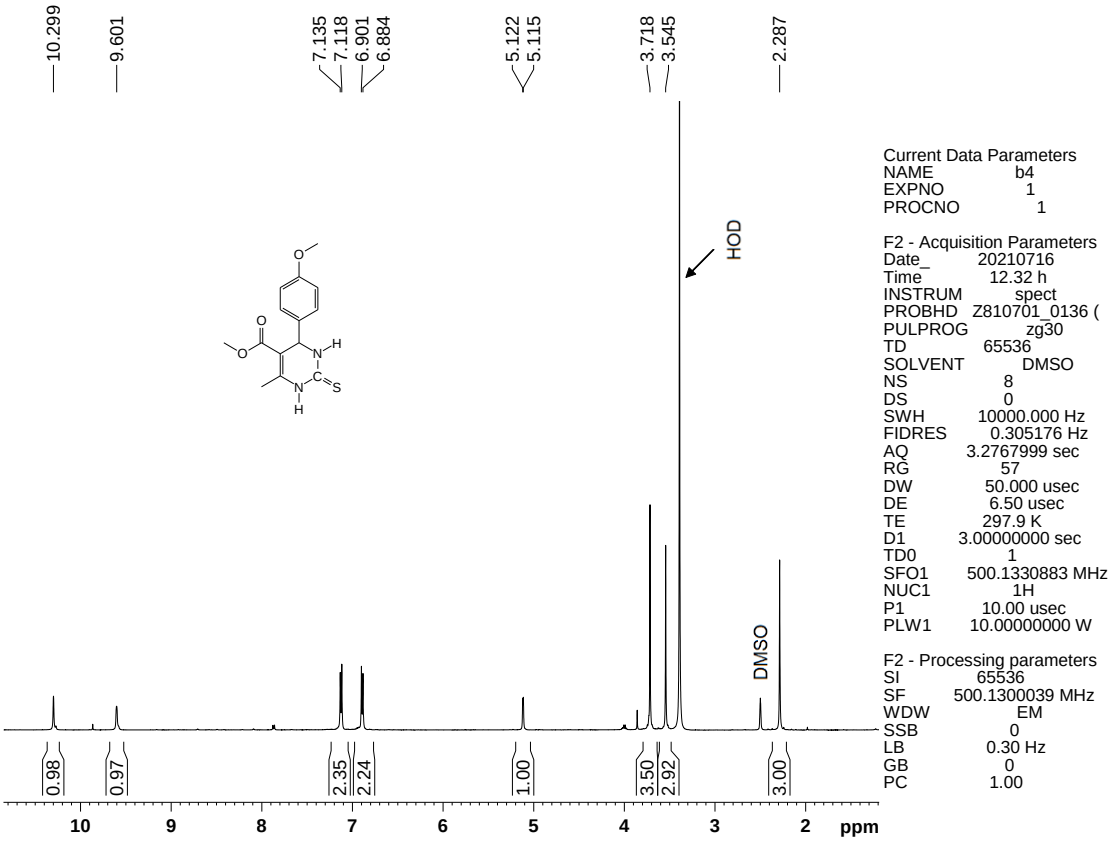


Fig S11 [1]H-NMR spectra of product B4 (*5-Methoxycarbonyl-4-(4-methoxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-thione*).

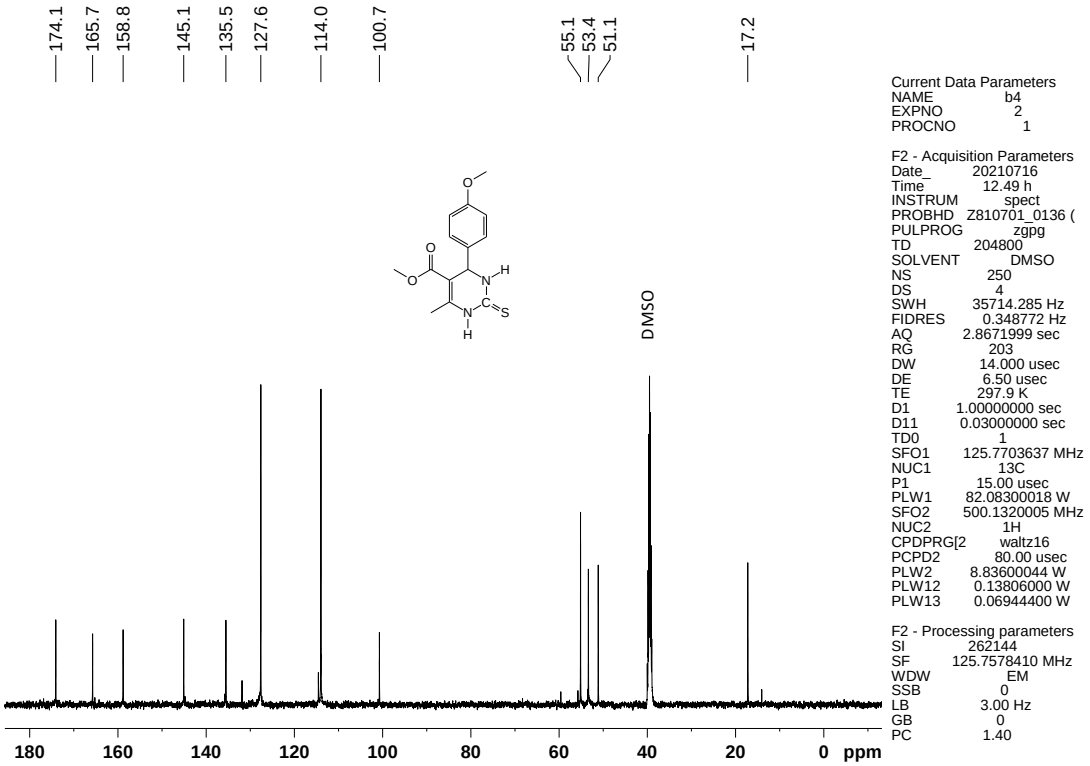


Fig S12. [13]C-NMR spectra of product B4 (*5-Methoxycarbonyl-4-(4-methoxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-thione*).

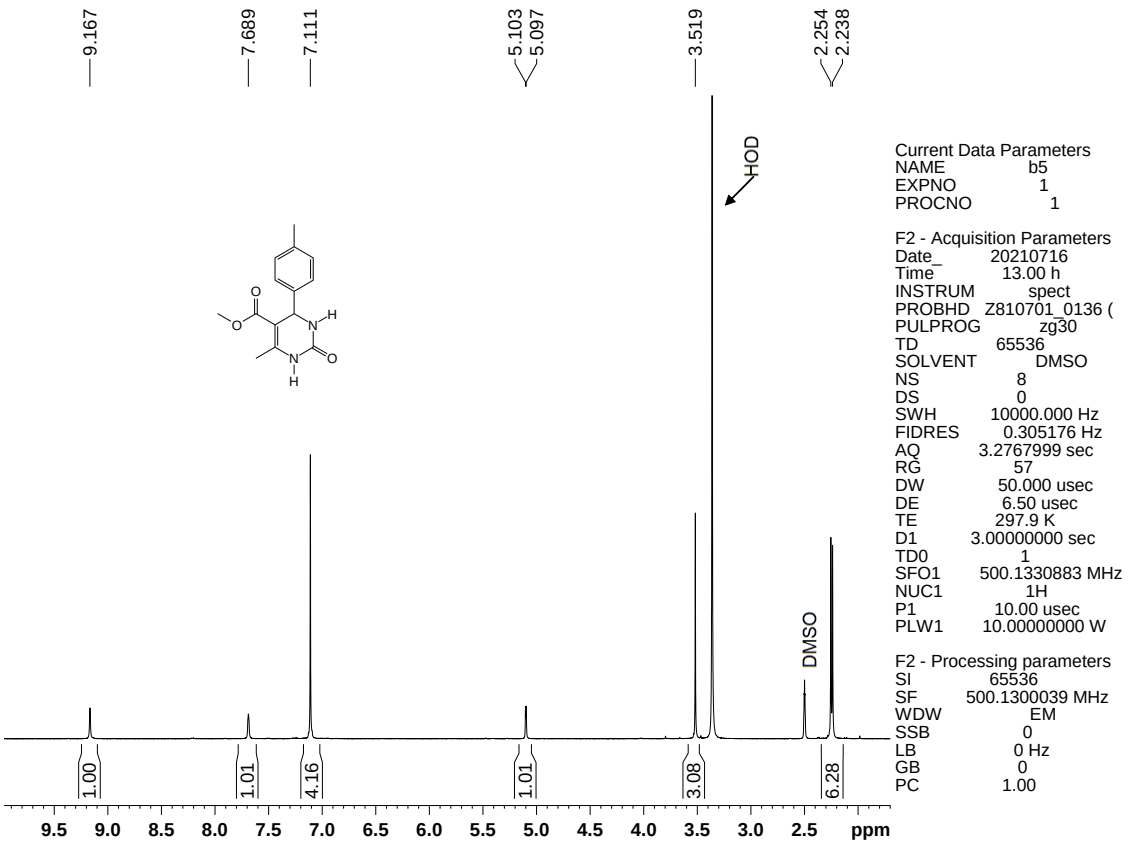


Fig S13 [1]H-NMR spectra of product B5 (*5-Methoxycarbonyl-4-(4-methlyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

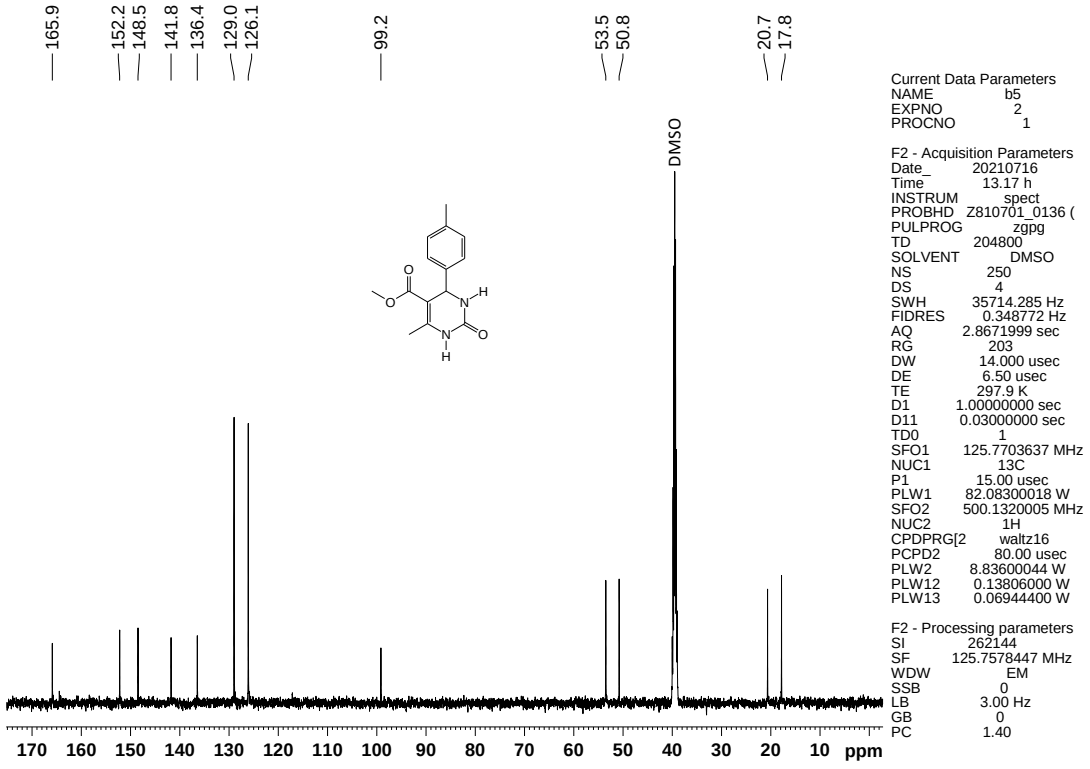


Fig S14 [13]C-NMR spectra of product B5 (*5-Methoxycarbonyl-4-(4-methlyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

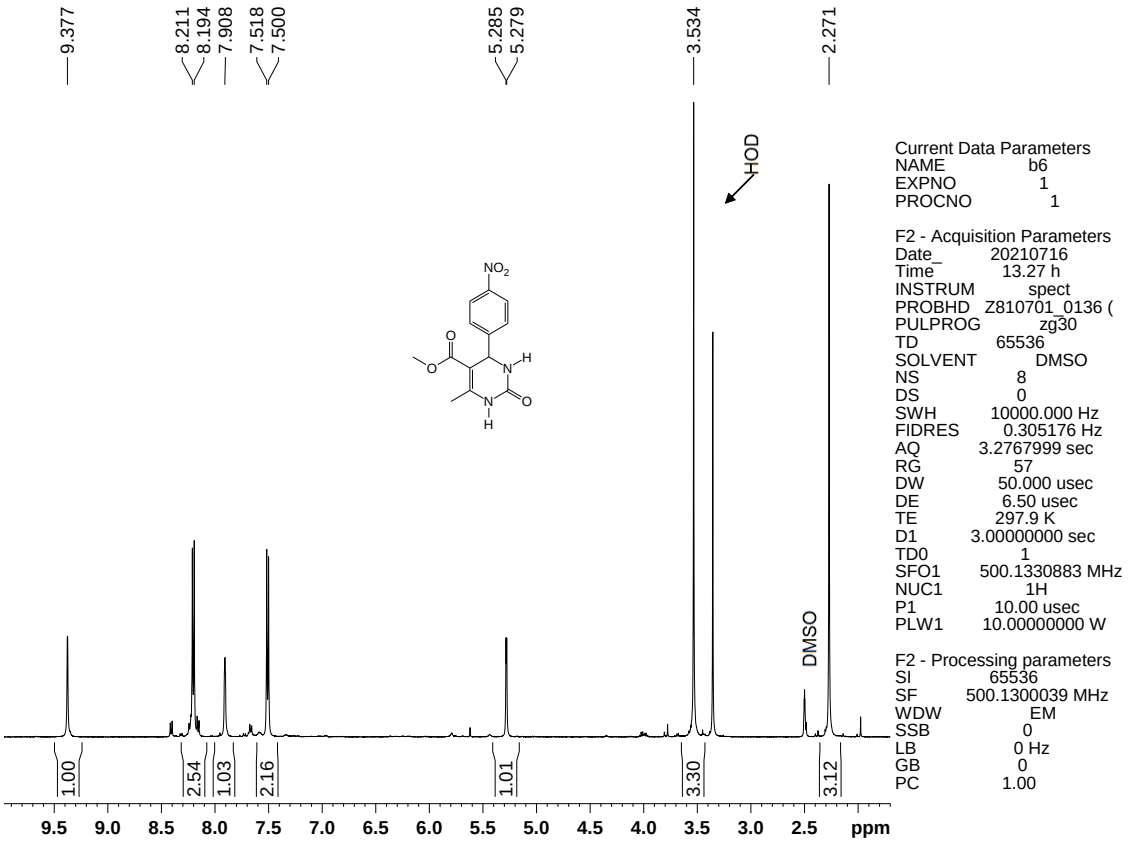


Fig S15 [1]H-NMR spectra of product B6 (*5-Methoxycarbonyl-4-(4-nitrophenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

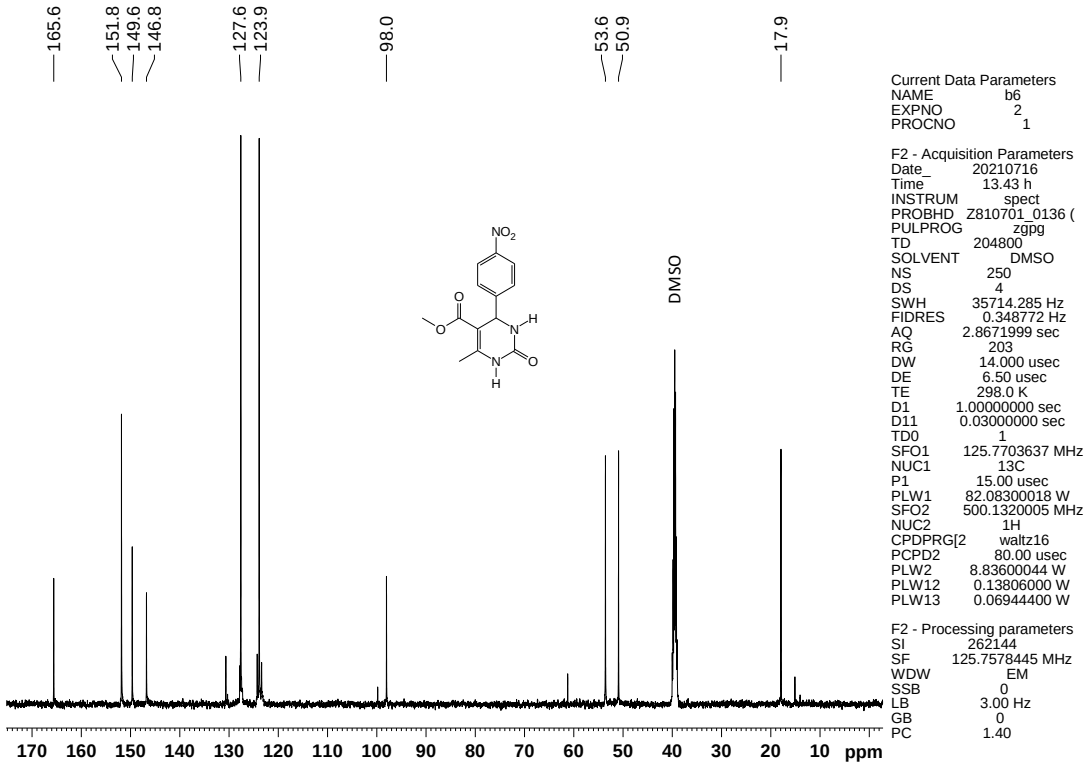


Fig S16 [13]C-NMR spectra of product B6 (*5-Methoxycarbonyl-4-(4-nitrophenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

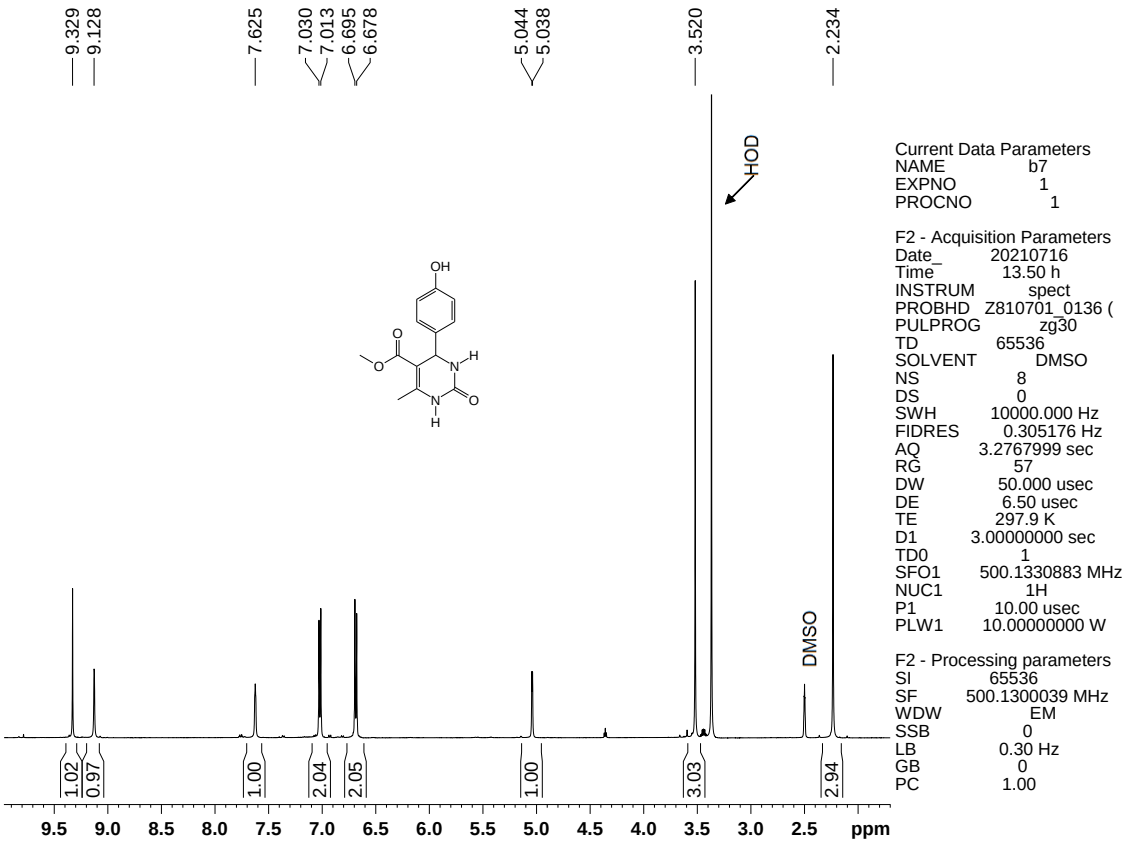


Fig S17 [1]H-NMR spectra of product B7 (*5-Methoxycarbonyl-4-(4-hydroxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

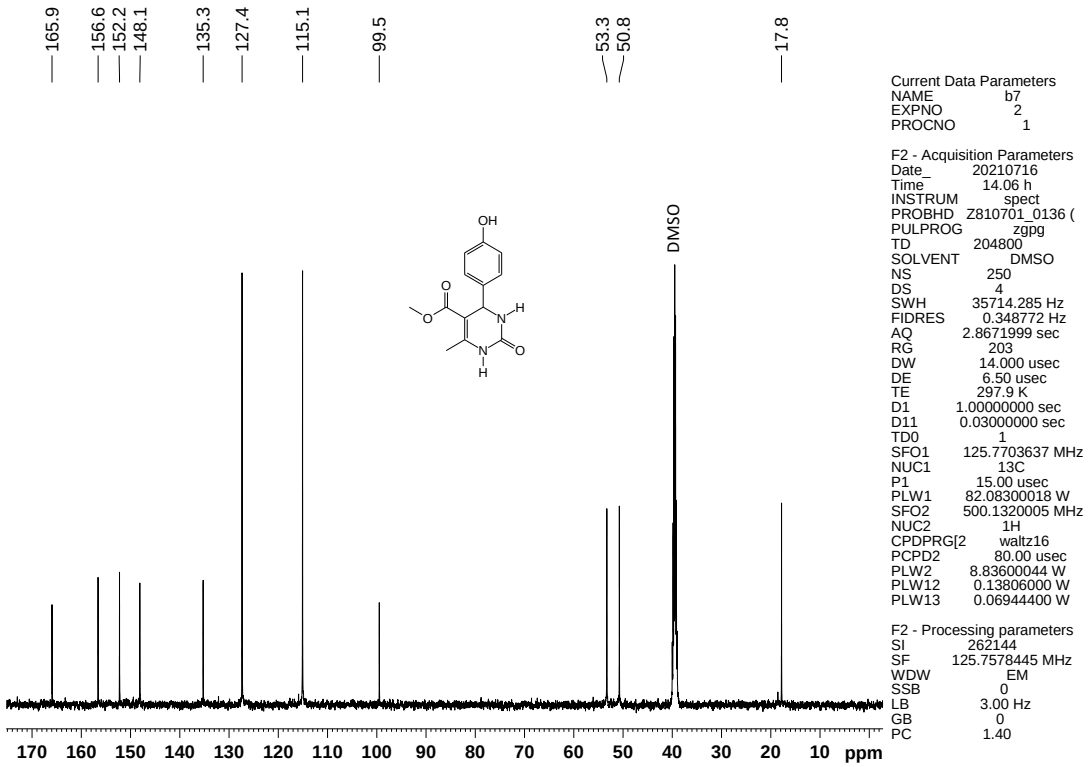


Fig S18 [13]C-NMR spectra of product B7 (*5-Methoxycarbonyl-4-(4-hydroxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

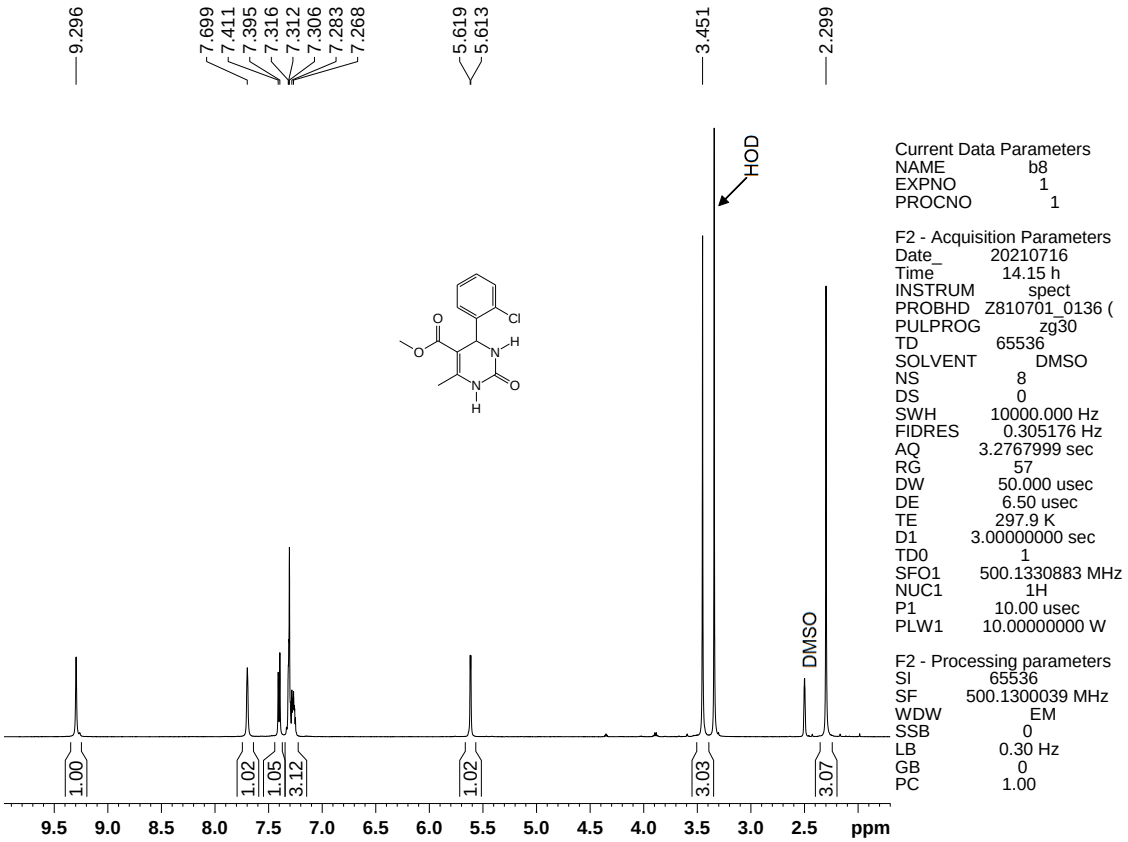


Fig S19 [1]H-NMR spectra of product B8 (*5-Methoxycarbonyl-4-(2-chlorophenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

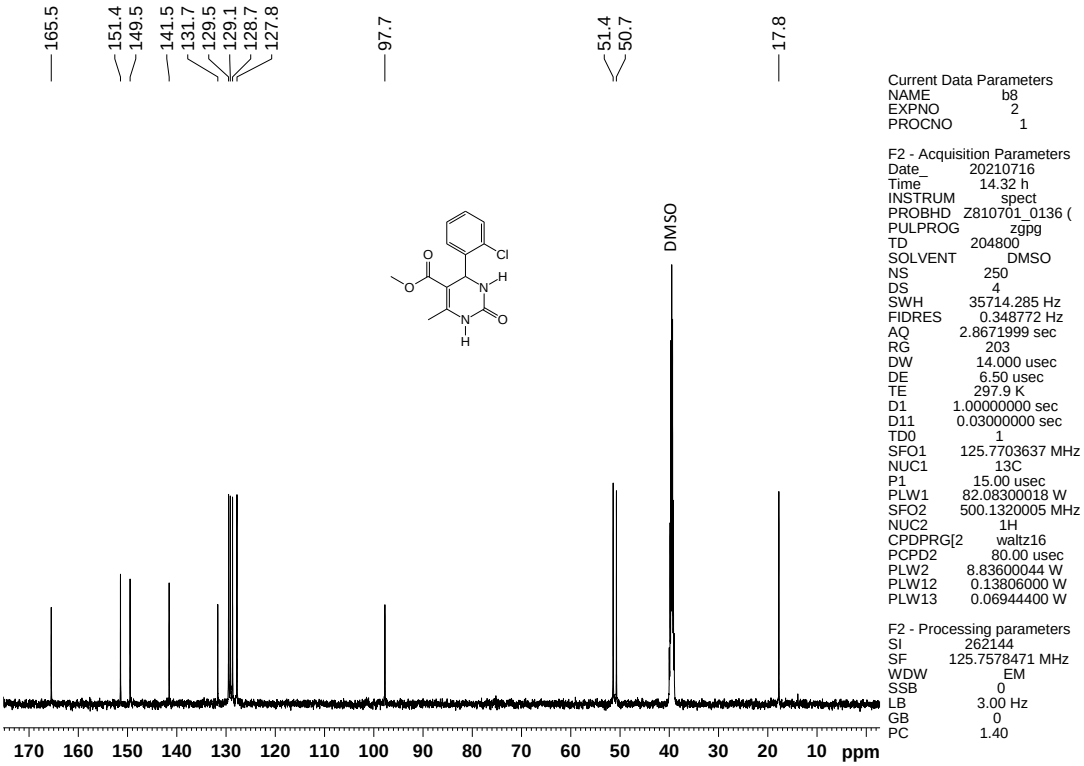


Fig S20 [13]C-NMR spectra of product B8 (*5-Methoxycarbonyl-4-(2-chlorophenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

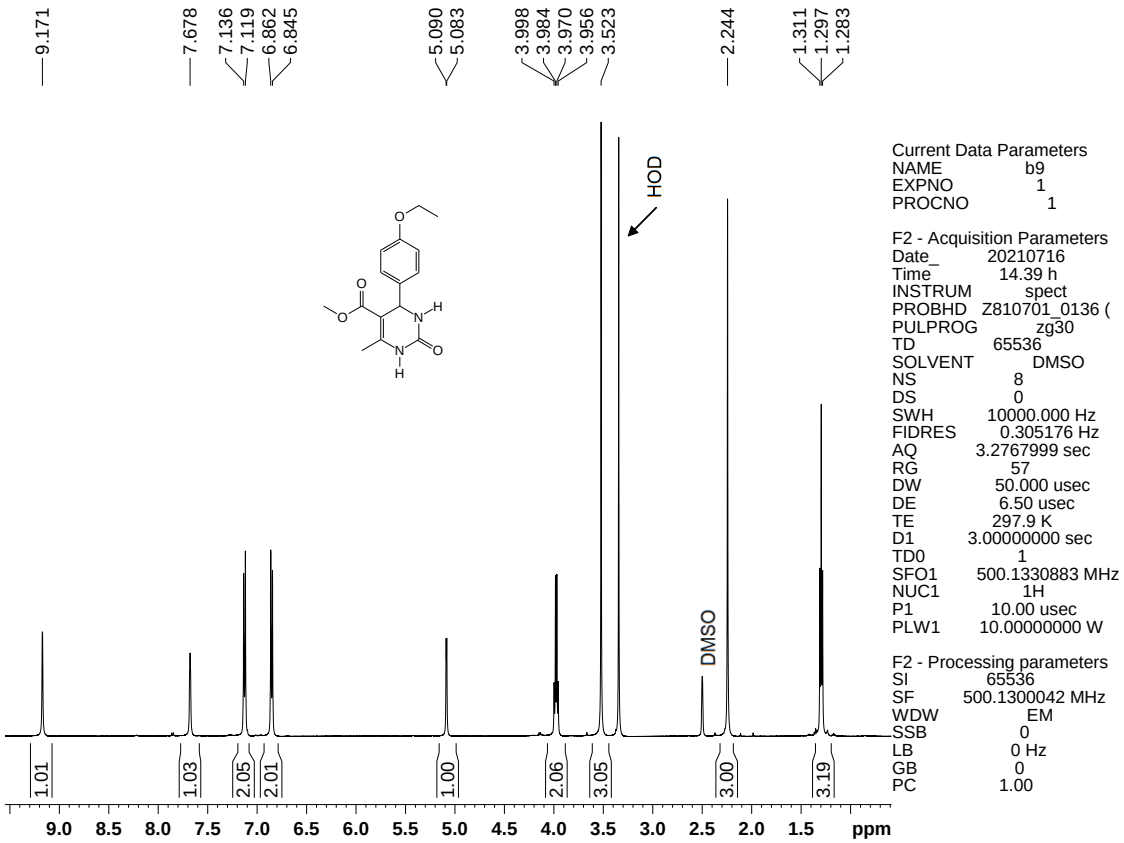


Fig S21 [1]H-NMR spectra of product B9 (*5-Methoxycarbonyl-4-(4-ethoxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

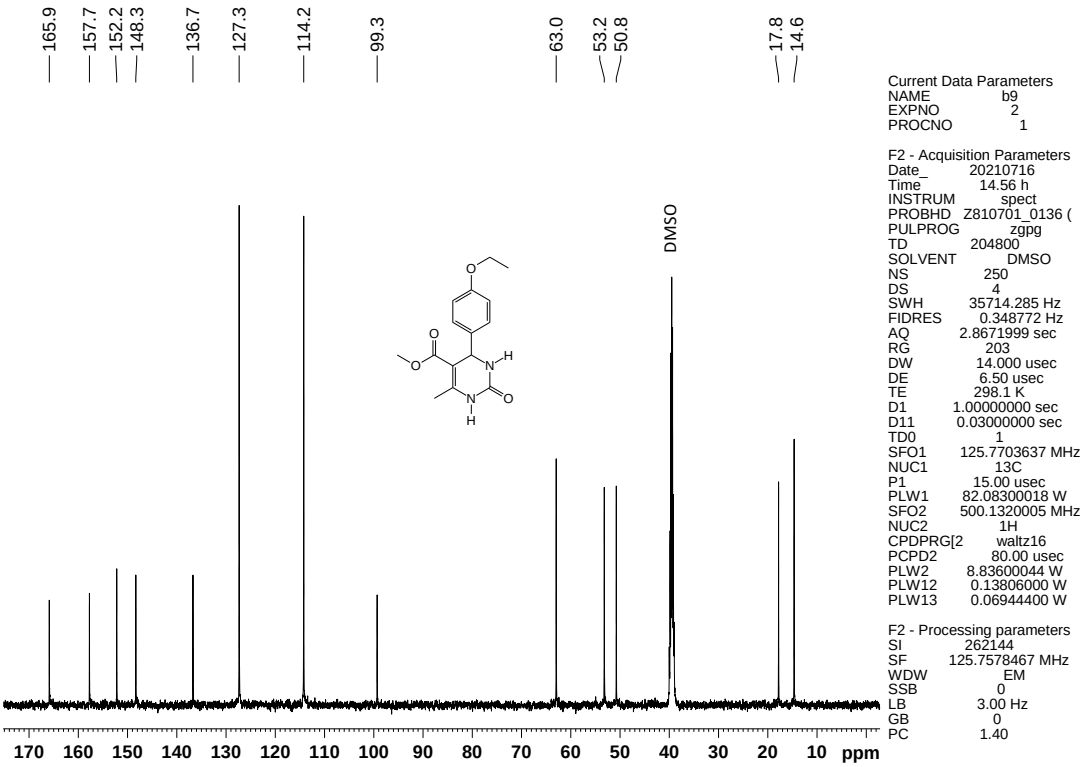


Fig S22 [13]C-NMR spectra of product B9 (*5-Methoxycarbonyl-4-(4-ethoxyphenyl)-6-methyl-3,4-dihydropyrimidin-2(1-H)-one*).

7. TEM images and SEM/EDX patterns of reused catalyst

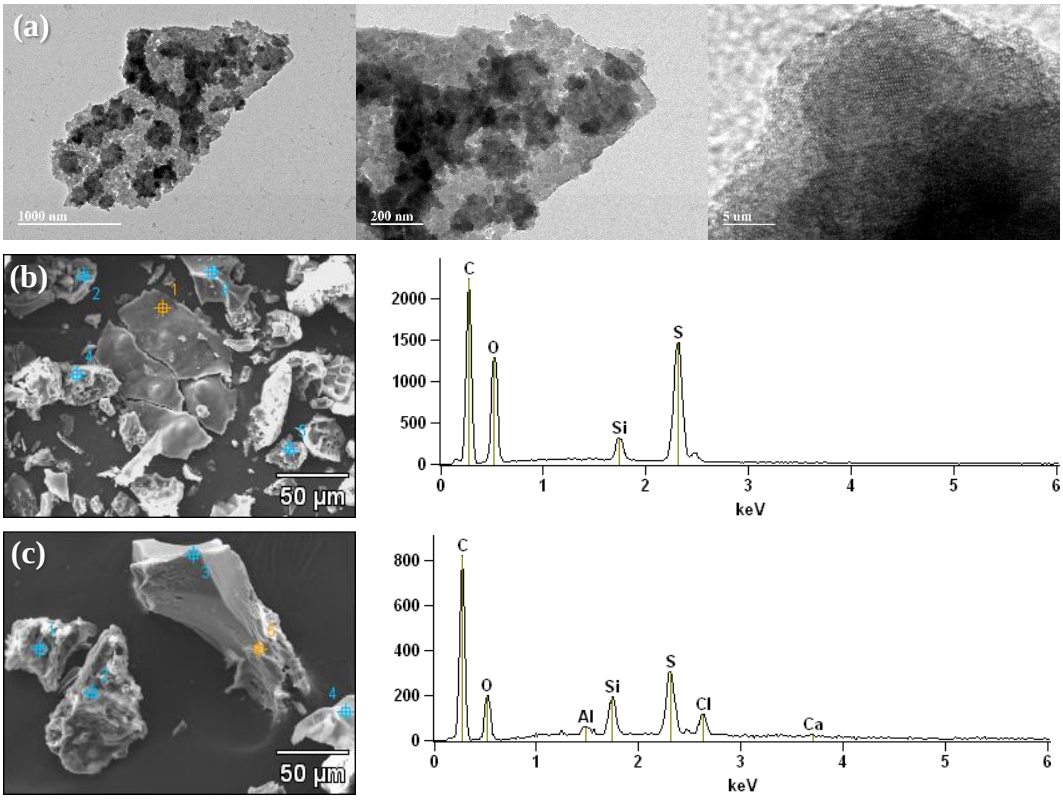


Fig S23 TEM images of reused CRH catalyst (a); SEM-EDX patterns of (b) fresh and (c) reused catalysts.

8. Test of catalyst reuse

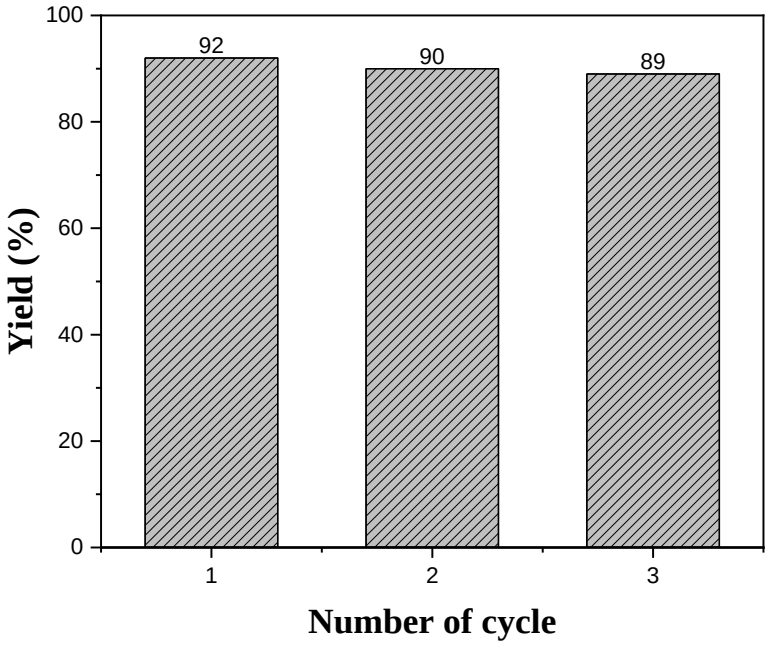


Fig S24 Reusability of CRH catalyst for Biginelli reaction