## Cu- Metal organic frameworks (Cu-MOF) as an environment-friendly and economically catalyst for one pot synthesis of tacrine derivatives

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Figure S2. FT-IR spectra of the fresh (a) and recycle (b) Cu-MOF catalyst.





Figure S3. FT-IR spectrum of 14-Amino-13-phenyl-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S4. Mass spectrum of 14-Amino-13-phenyl-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S5. <sup>1</sup>H NMR spectrum of 14-Amino-13-phenyl-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S6. <sup>13</sup>C NMR spectrum of 14-Amino-13-phenyl-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione





Figure S7. FT-IR spectrum of 14-Amino-13-(4-chlorophenyl)-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S8. Mass spectrum of 14-Amino-13-(4-chlorophenyl)-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



## Figure S9. <sup>1</sup>H NMR spectrum of 14-Amino-13-(4-chlorophenyl)-2,3,4,13-tetrahydro-1Hbenzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S10. <sup>13</sup>C NMR spectrum of 14-Amino-13-(4-chlorophenyl)-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione







Figure S11. FT-IR spectrum of 14-Amino-13-(3-methoxyphenyl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S12. Mass spectrum of 14-Amino-13-(3-methoxyphenyl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



## Figure S13. <sup>1</sup>H NMR spectrum of 14-Amino-13-(3-methoxyphenyl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S14. <sup>13</sup>C NMR spectrum of 14-Amino-13-(3-methoxyphenyl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione







Figure S15. FT-IR spectrum of 14-Amino-13-(p-tolyl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S16. Mass spectrum of 14-Amino-13-(p-tolyl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione

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Figure S17. <sup>1</sup>H NMR spectrum of 14-Amino-13-(p-tolyl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S18. <sup>13</sup>C NMR spectrum of 14-Amino-13-(p-tolyl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione





Figure S19. FT-IR spectrum of 14-Amino-13-(thiophen-2-yl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S20. Mass spectrum of 14-Amino-13-(thiophen-2-yl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S21. <sup>1</sup>H NMR spectrum of 14-Amino-13-(thiophen-2-yl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S22. <sup>13</sup>C NMR spectrum of 14-Amino-13-(thiophen-2-yl)-2,3,4,13-tetrahydro-1*H*-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione





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Figure S23. FT-IR spectrum of 13-Amino-12-(p-tolyl)-1,2,3,12-tetrahydrobenzo[6,7]chromeno[2,3-b]cyclopenta[e]pyridine-6,11-dione



Figure S24. Mass spectrum of 13-Amino-12-(p-tolyl)-1,2,3,12-tetrahydrobenzo[6,7]chromeno[2,3-b]cyclopenta[e]pyridine-6,11-dione

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Figure S26. <sup>13</sup>C NMR spectrum of 13-Amino-12-(p-tolyl)-1,2,3,12-tetrahydrobenzo[6,7]chromeno[2,3-b]cyclopenta[e]pyridine-6,11-dione









Figure S28. Mass spectrum of 13-Amino-14-(p-tolyl)-8,9,10,11,12,14-hexahydrobenzo[6,7]chromeno[2,3 b]cyclohepta[e]pyridine-5,15-dione





Figure S29. <sup>1</sup>H NMR spectrum of 13-Amino-14-(p-tolyl)-8,9,10,11,12,14-hexahydrobenzo[6,7]chromeno[2,3 b]cyclohepta[e]pyridine-5,15-dione

Figure S30. <sup>13</sup>C NMR spectrum of 13-Amino-14-(p-tolyl)-8,9,10,11,12,14-hexahydrobenzo[6,7]chromeno[2,3 b]cyclohepta[e]pyridine-5,15-dione





Figure S31. FT-IR spectrum of 14-Amino-13-(2-chlorophenyl)-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S32. Mass spectrum of 14-Amino-13-(2-chlorophenyl)-2,3,4,13-tetrahydro-1Hbenzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S33. <sup>1</sup>H NMR spectrum of 14-Amino-13-(2-chlorophenyl)-2,3,4,13-tetrahydro-1Hbenzo[6,7]chromeno[2,3-b]quinoline-7,12-dione



Figure S34. <sup>13</sup>C NMR spectrum of 14-Amino-13-(2-chlorophenyl)-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione





Figure S35. FT-IR spectrum of 14-Amino-13-phenyl-4,13-dihydro-1H,3H-benzo[6,7]chromeno[2,3-b]thiopyrano[3,4-e]pyridine-7,12-dione



Figure S36. Mass spectrum of 14-Amino-13-phenyl-4,13-dihydro-1H,3H-benzo[6,7]chromeno[2,3-b]thiopyrano[3,4-e]pyridine-7,12-dione







Figure S38. <sup>13</sup>C NMR spectrum of 14-Amino-13-phenyl-2,3,4,13-tetrahydro-1H-benzo[6,7]chromeno[2,3-b]quinoline-7,12-dione





Figure S39. FT-IR spectrum of 14-Amino-13-(4-nitrophenyl)-4,13-dihydro-1H,3H-benzo[6,7]chromeno[2,3-b]thiopyrano[3,4-e]pyridine-7,12-dione



Figure S40. Mass spectrum of 14-Amino-13-(4-nitrophenyl)-4,13-dihydro-1H,3H-benzo[6,7]chromeno[2,3-b]thiopyrano[3,4-e]pyridine-7,12-dione







Figure S42. <sup>13</sup>C NMR spectrum of 14-Amino-13-(4-nitrophenyl)-4,13-dihydro-1H,3H-benzo[6,7]chromeno[2,3-b]thiopyrano[3,4-e]pyridine-7,12-dione









Figure S44. Mass spectrum of 14-Amino-13-(4-chlorophenyl)-4,13-dihydro-1H,3H-benzo[6,7]chromeno[2,3-b]thiopyrano[3,4-e]pyridine-7,12-dione







Figure S46. <sup>13</sup>C NMR spectrum of 14-Amino-13-(4-chlorophenyl)-4,13-dihydro-1H,3Hbenzo[6,7]chromeno[2,3-b]thiopyrano[3,4-e]pyridine-7,12-dione

