

Supplementary information

Co₃O₄/NiO@GQDs@SO₃H nanocomposite as a superior catalyst for the synthesis of chromenpyrimidines

Javad Safaei-Ghomi*, Zahra Omidshafiei

Department of Organic Chemistry, Faculty of Chemistry, University of Kashan, Kashan, P.O. Box 87317-51167, I. R. Iran Corresponding author. E-mail addresses: safaei@kashanu.ac.ir, Fax: +98-31-55912397; Tel.: +98-31-55912385

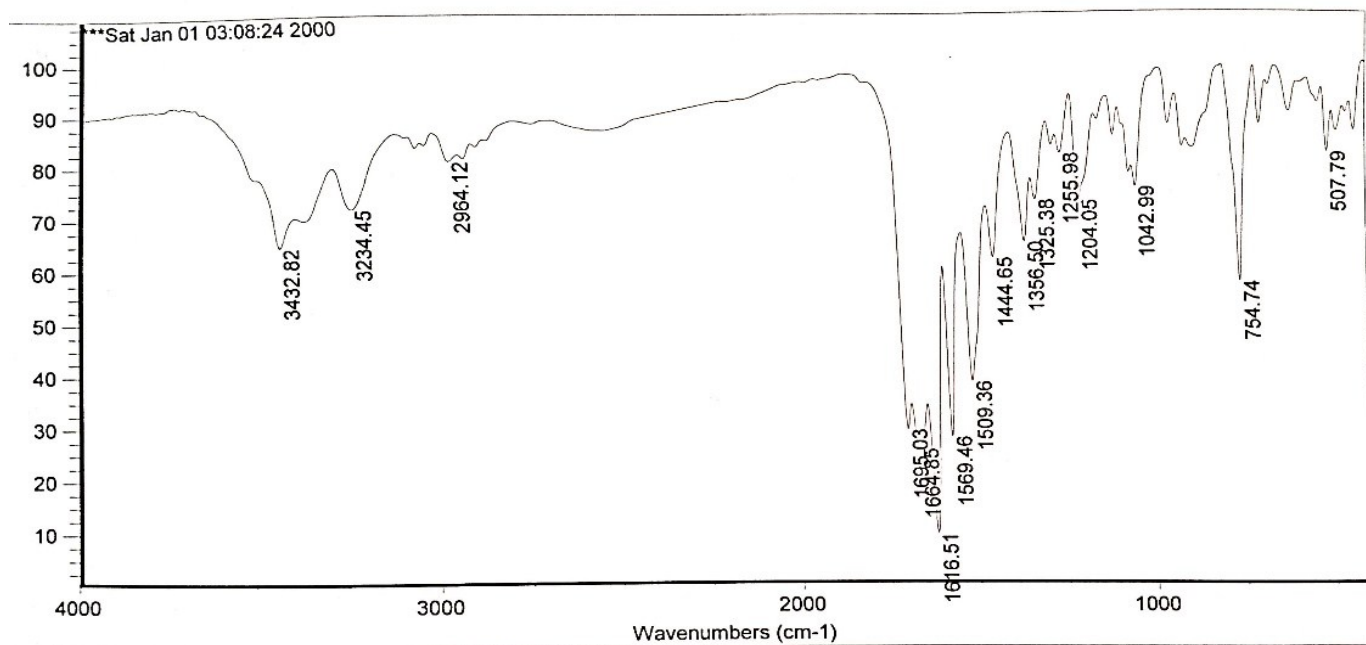
General procedure for the preparation of chromenpyrimidines:

A mixture of aldehyde (1 mmol), 6-amino-1,3-dimethyluracil (1 mmol), 4-hydroxy coumarine (1 mmol) and 5 mg $\text{Co}_3\text{O}_4/\text{NiO}@G\text{QDs}@SO_3\text{H}$ nanocomposite were stirred in 5 mL ethanol under reflux condition. The reaction was monitored by TLC. After completion of the reaction, the solution was filtered and the heterogeneous catalyst was recovered. Water was added, and the precipitate was collected by filtration and washed with water. The crude product was recrystallized or washed with ethanol to give the pure product.

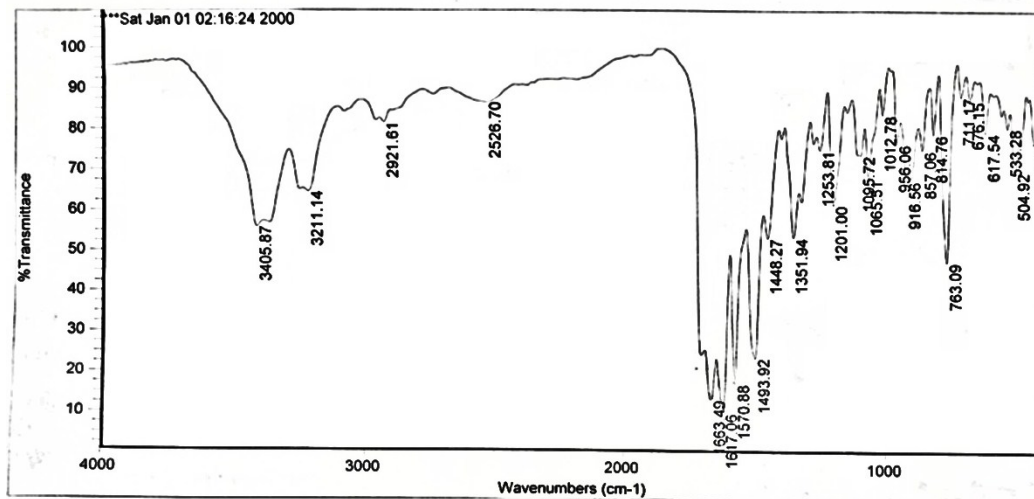
The conversion is described as ratios of how much of a reactant has reacted.

$$\text{Conversion efficiency} = \frac{\textit{The amount of Limiting reagent consumed}}{\textit{The amount of Limiting reagent in}} \times 100$$

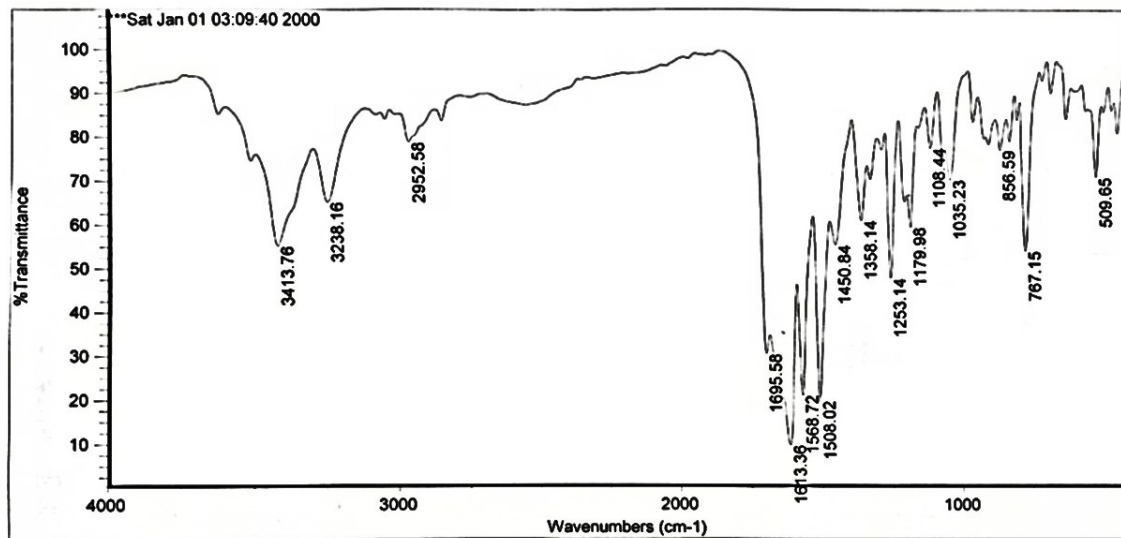
FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (phenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4a):



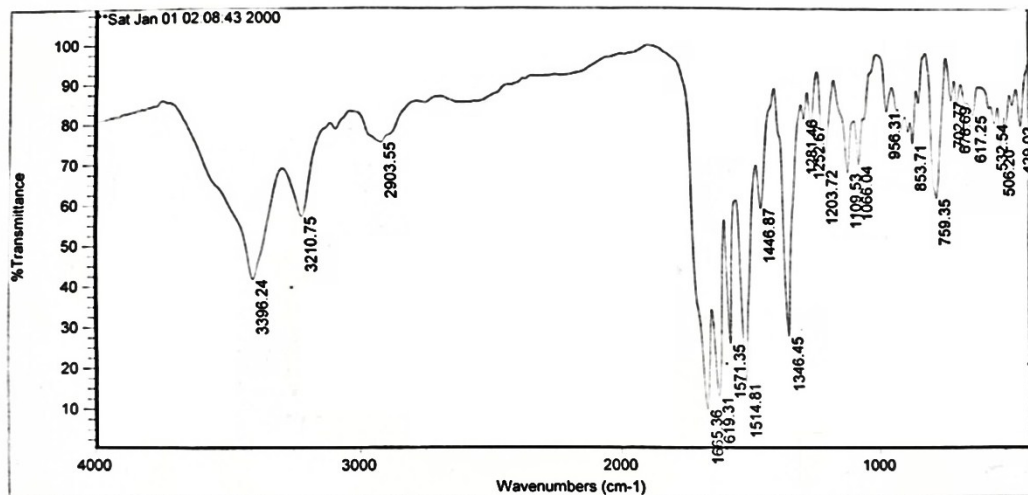
FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-chlorophenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4b):



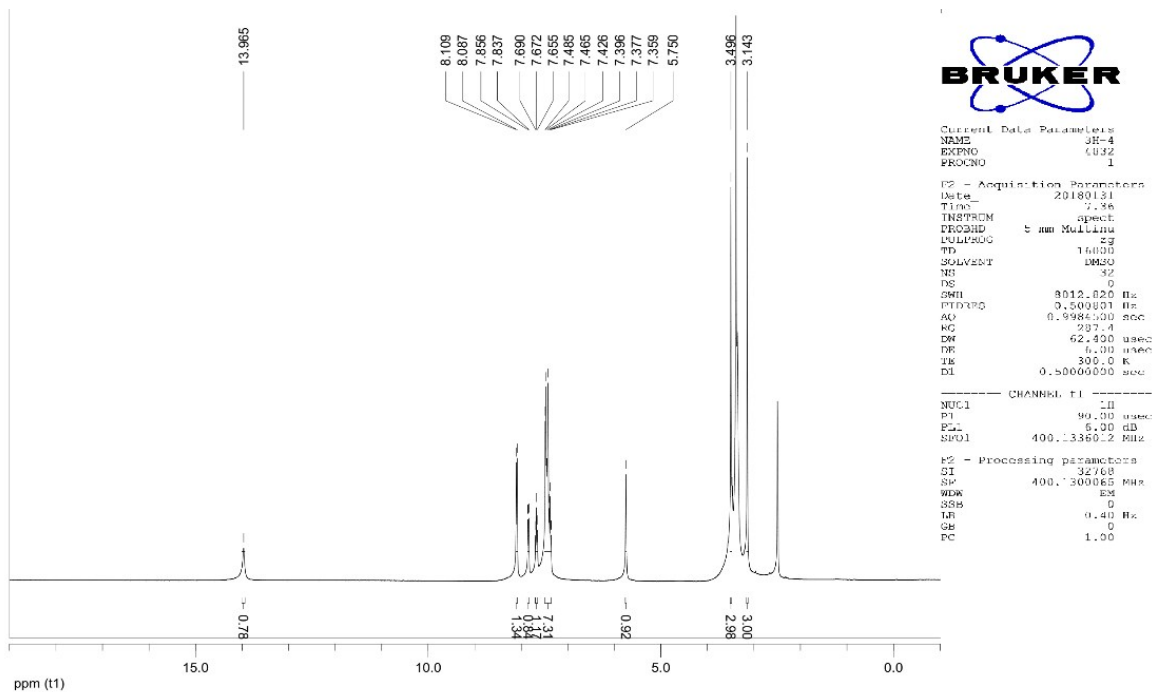
FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-methoxyphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4c):



FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-nitrophenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4d):

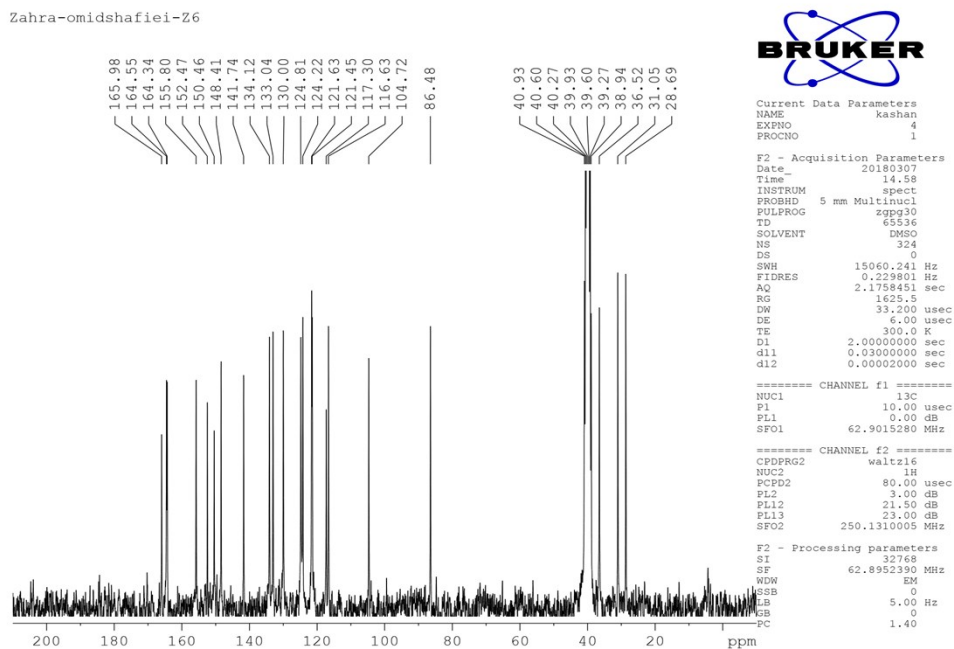


¹H NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-nitrophenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4d):

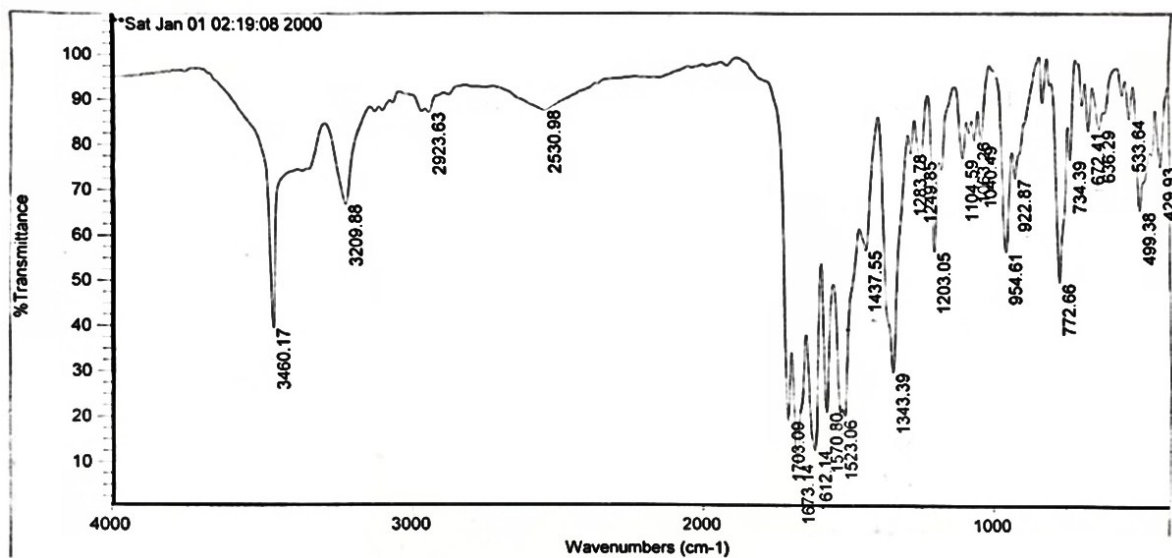


¹³C NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-nitrophenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4d):

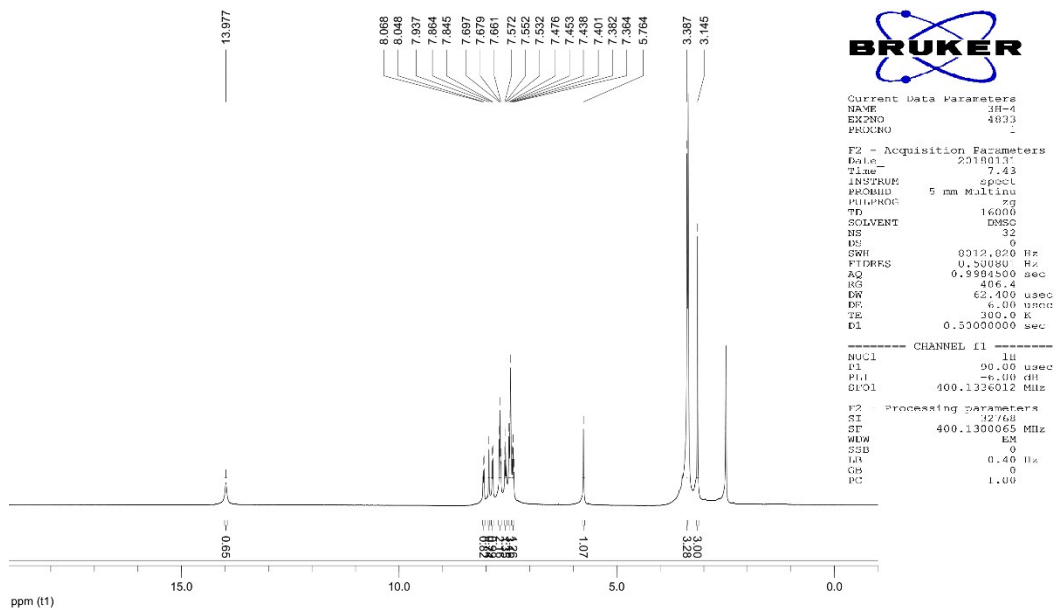
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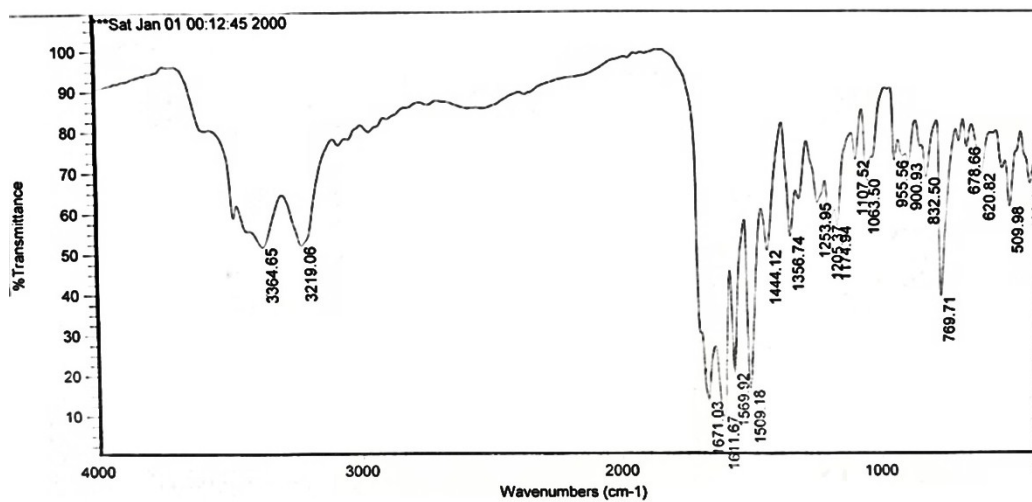
FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (3-nitrophenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4e):



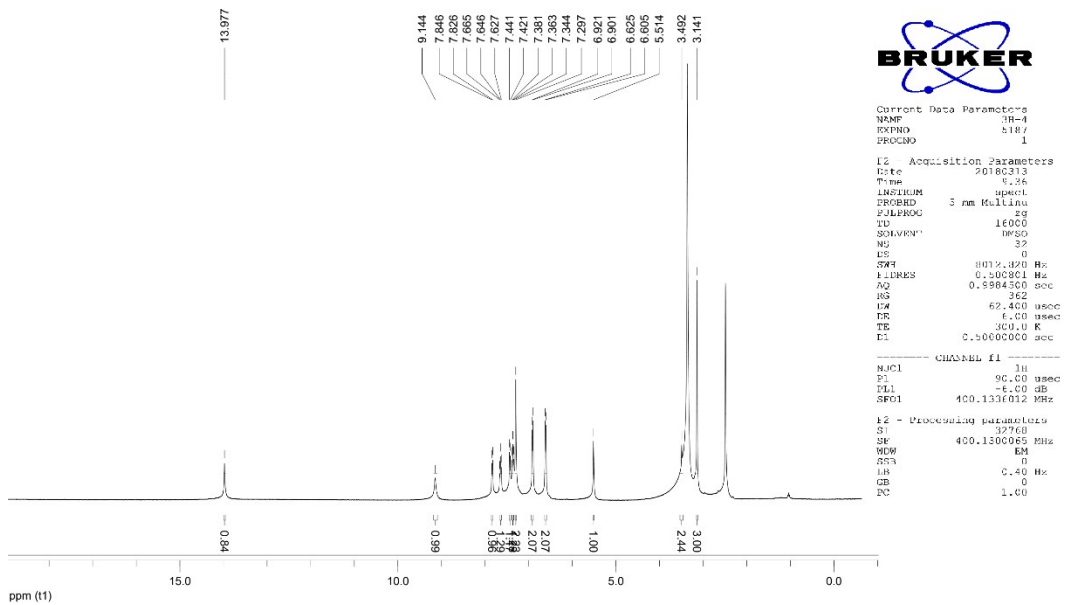
¹H NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (3-nitrophenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4e):



FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-hydroxyphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4f):

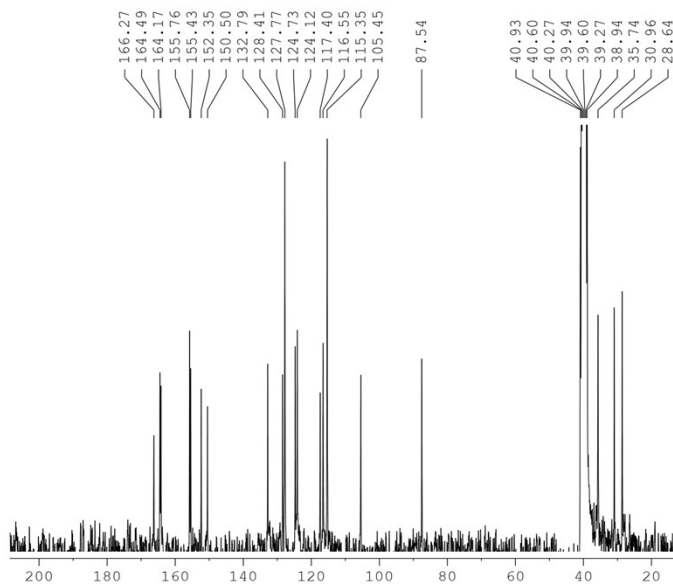


¹H NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-hydroxyphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4f):



¹³C NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-hydroxyphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4f):

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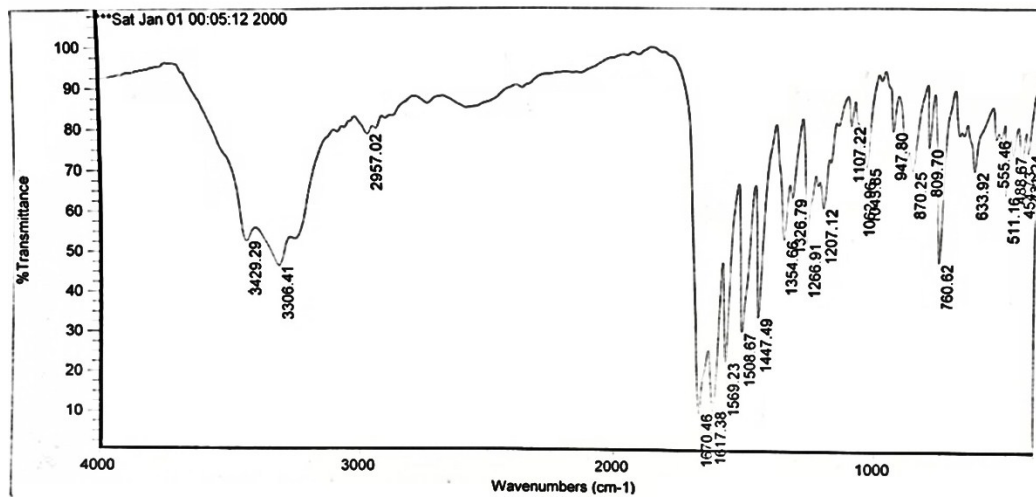
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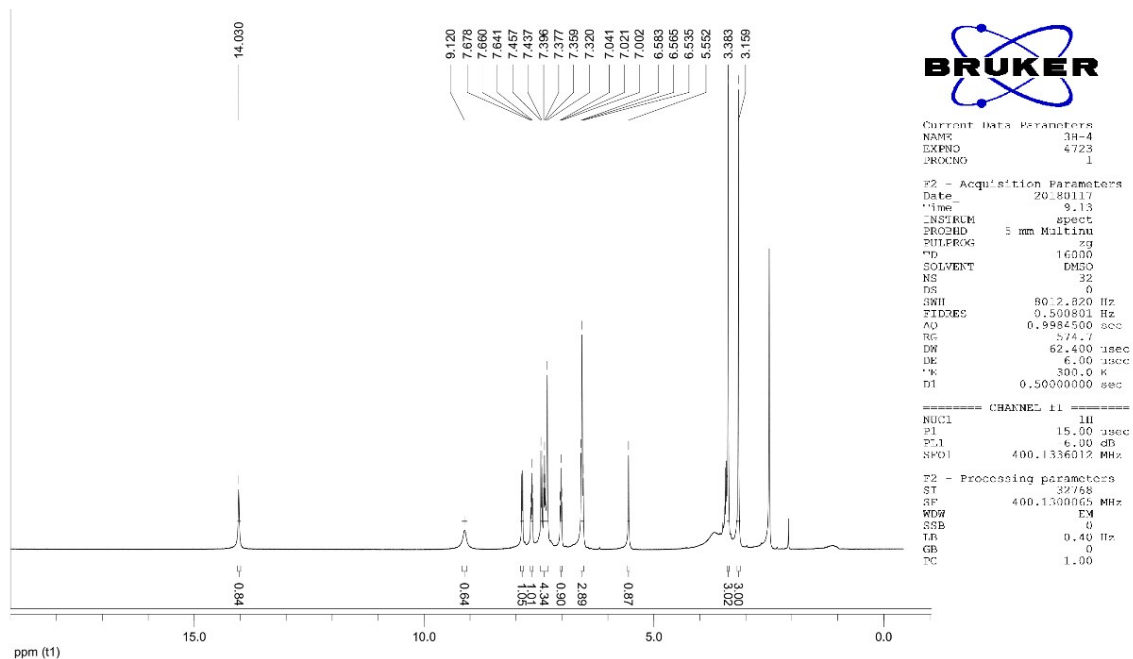
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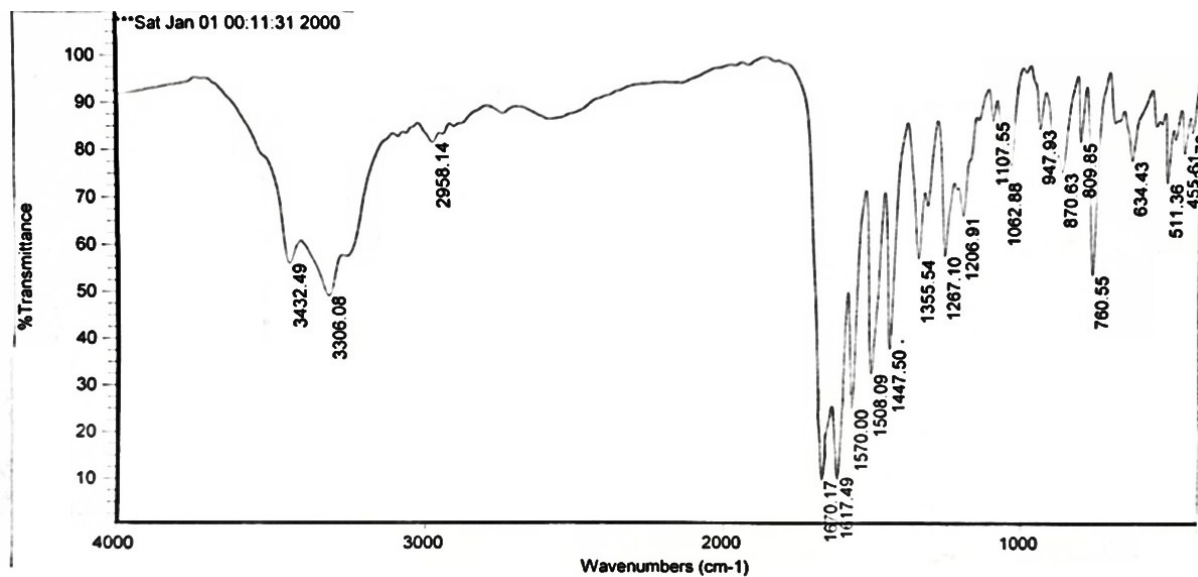

FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (3-hydroxyphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4g):



¹H NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (3-hydroxyphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4g):

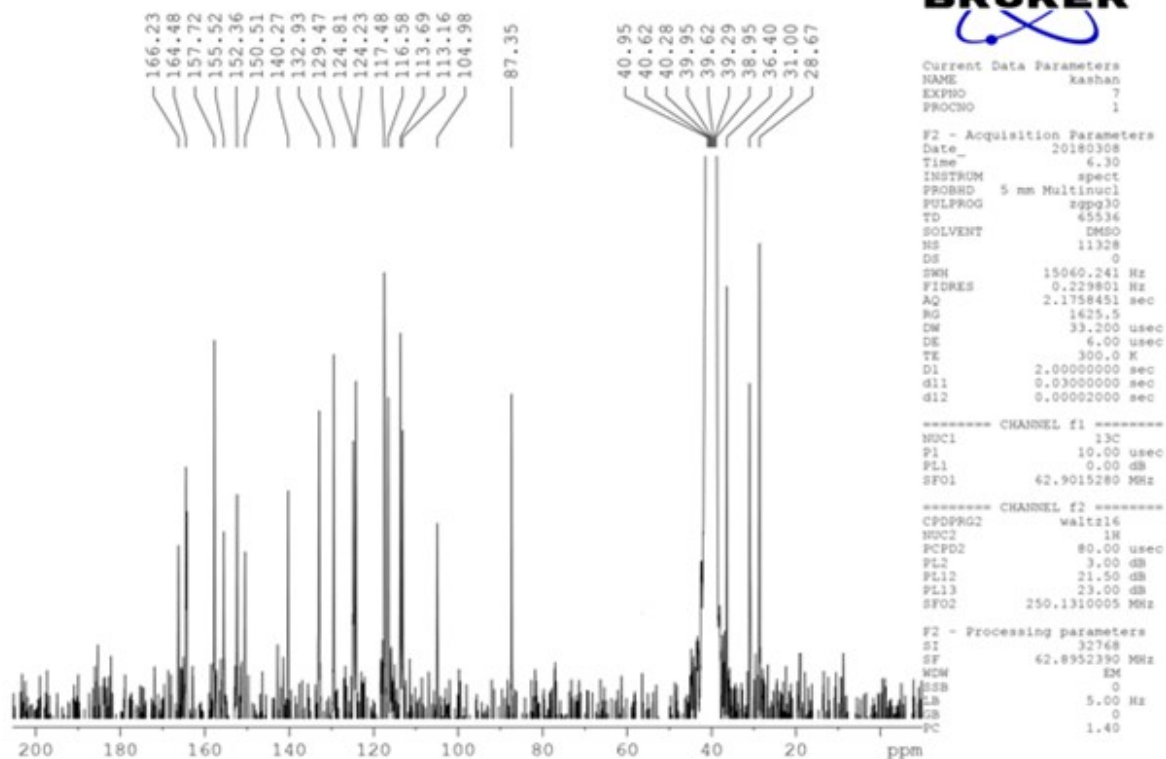


FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (2-hydroxyphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4h):

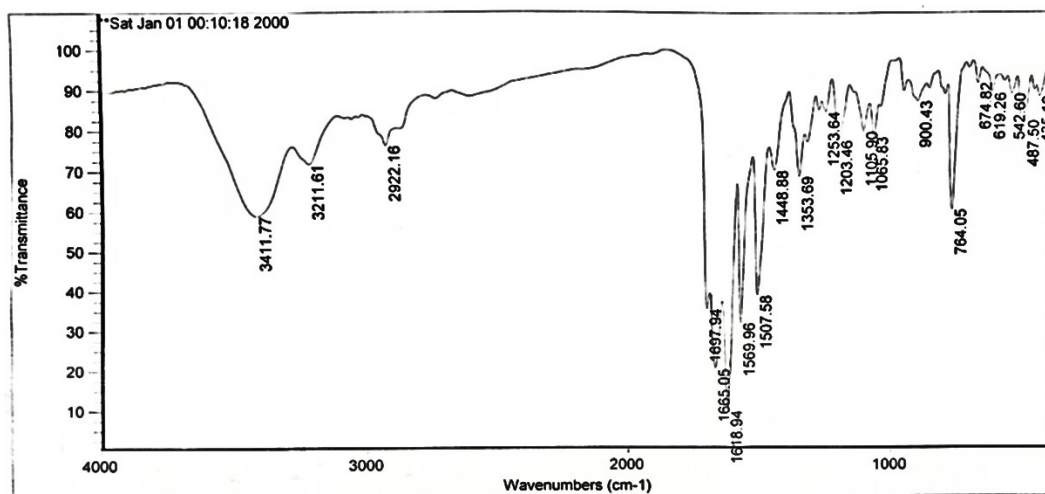


C NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (2-hydroxyphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4h):

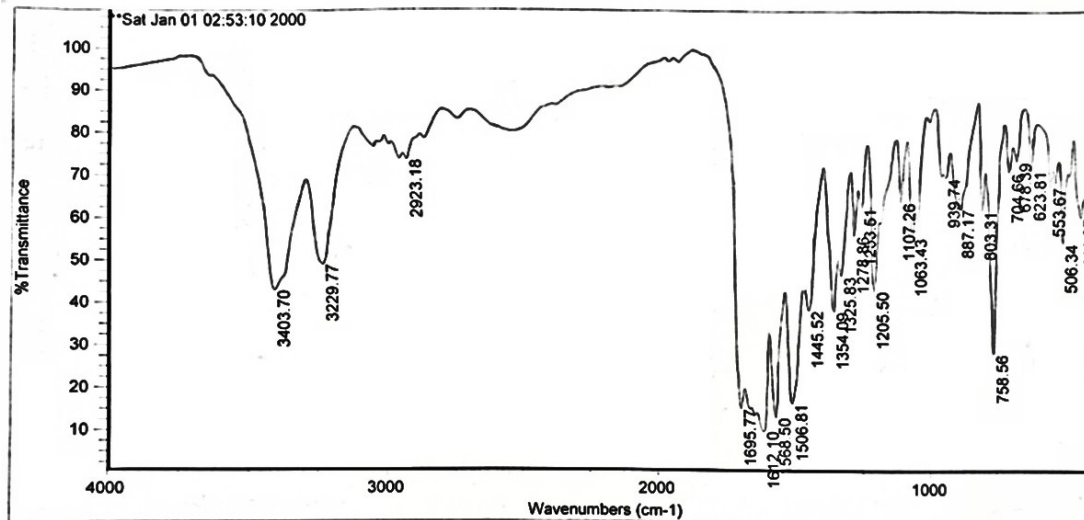
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FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-methylphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4i):

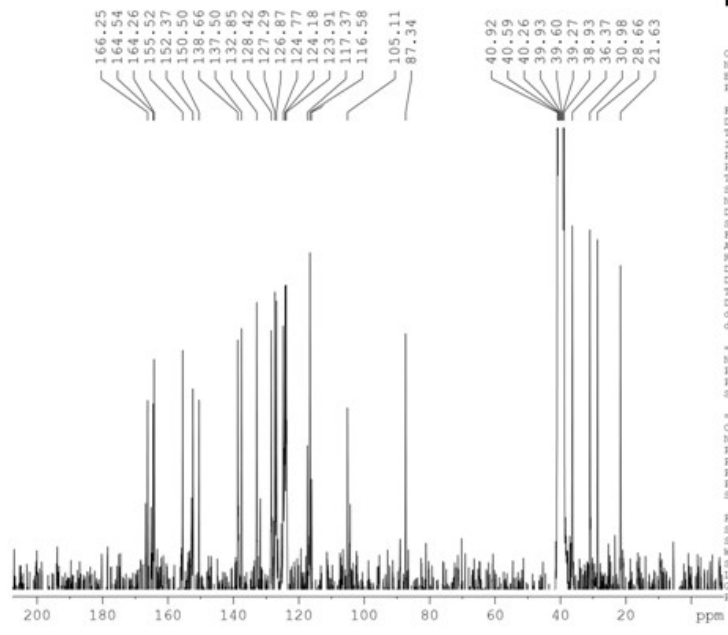


FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (3-methylphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4j):



C NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (3-methylphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4j):

Zahra-OmidShafie-Z10



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PROCNO        1

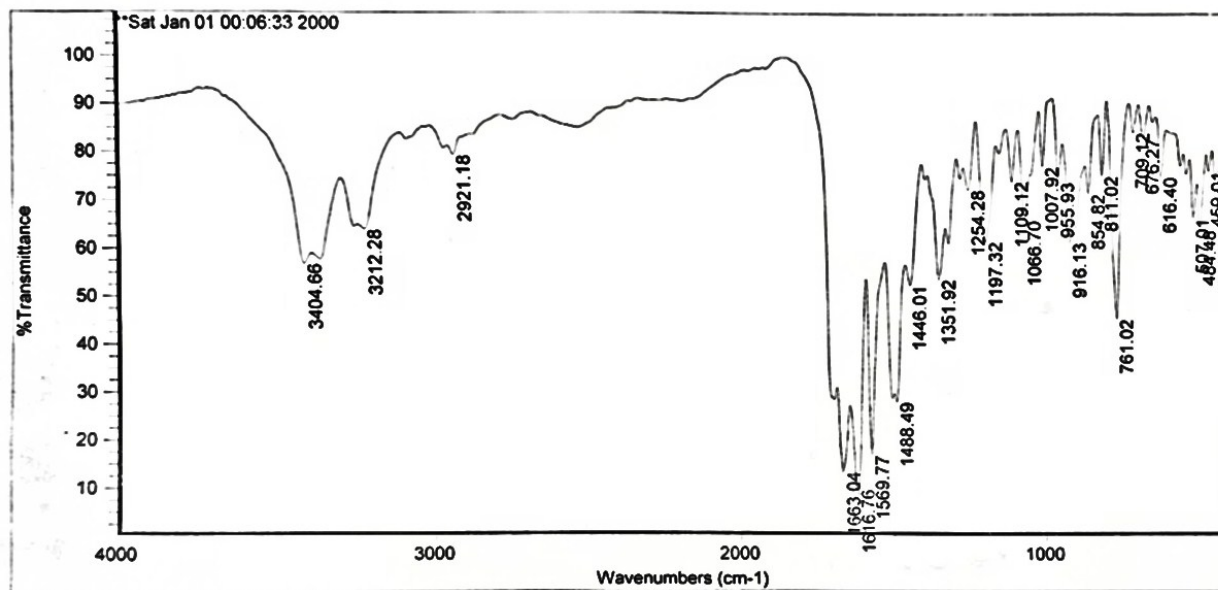
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SFO1          62.9015280 MHz

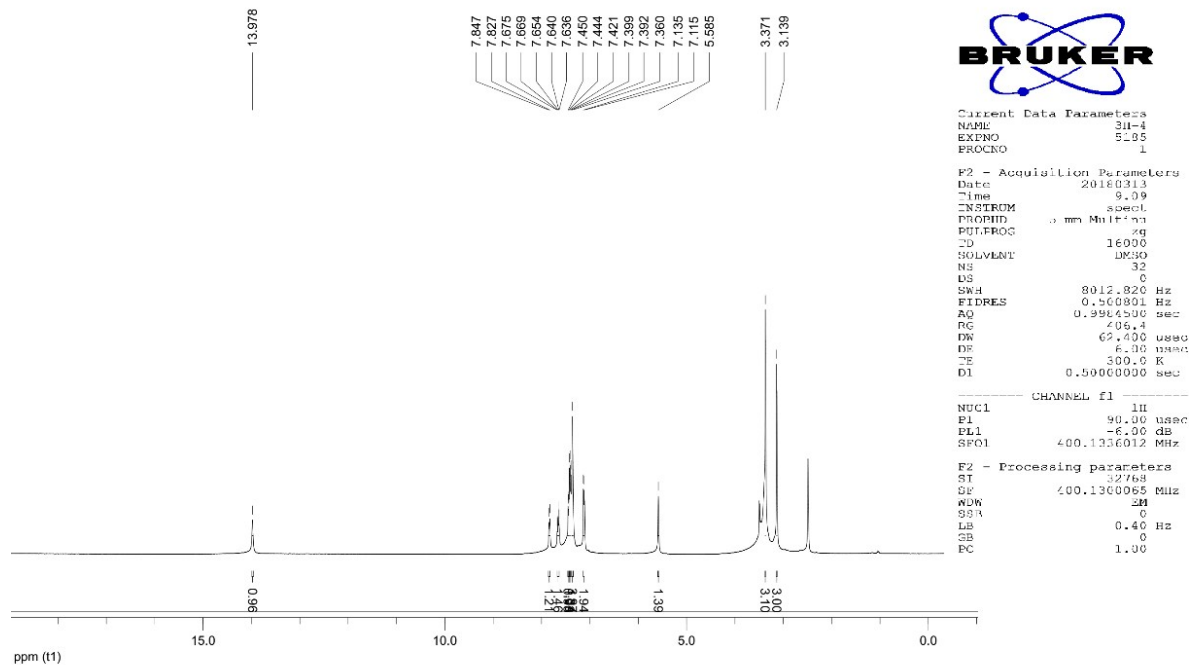
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PL12          21.50 dB
PL13          23.00 dB
SFO2          250.1310005 MHz

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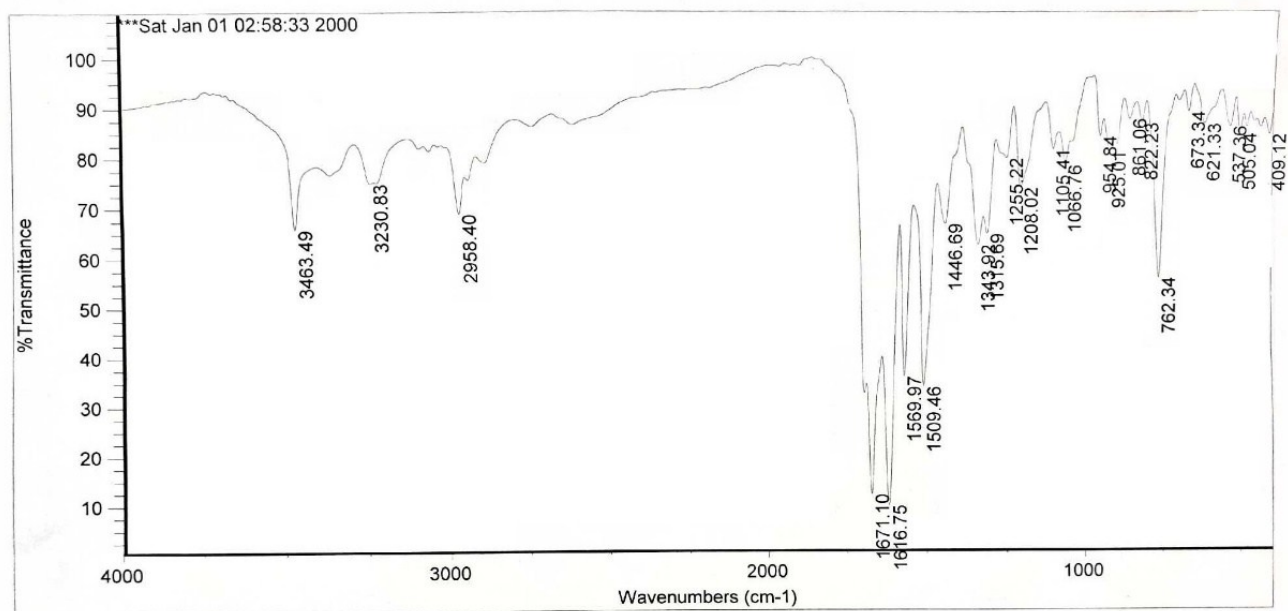
FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-bromophenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4k):



¹H NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-bromophenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4k):



FT-IR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-isopropylphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4l):



¹H NMR: 6-Amino-5-((4-hydroxy-2-oxo-2H-chromen-3-yl) (4-isopropylphenyl) methyl)-1,3-dimethylpyrimidine-2,4(1H,3H)-dione (4l):

