

## Hydrate formation in pyridinium pamoate salts

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## Supplementary Information

Powder X-ray diffraction (PXRD) patterns were collected for bulk samples in order to confirm the nature of the products obtained from solution. The results are summarised in Table 1 of the manuscript (reproduced below). Simulated and experimental powder patterns for products obtained from solvent/water mixtures are given in Figures S1-S21.

PXRD patterns were also obtained for the products of grinding experiments. Selected results are given in Figure S22-S23.

Powder X-ray diffraction patterns were collected on a PANalytical X'Pert PRO diffractometer with an X'Celerator detector and Cu radiation source with a Ni filter. Samples were spun during the data collection. In all powder diffraction patterns, the  $\gamma$ -axis gives intensity counts in arbitrary units.

Patterns were simulated and diagrams prepared using X'Pert HighScore Plus (2009, PANalytical BV). Note that patterns were simulated from structures collected at 100 K, whilst experimental PXRD patterns were collected at room temperature.

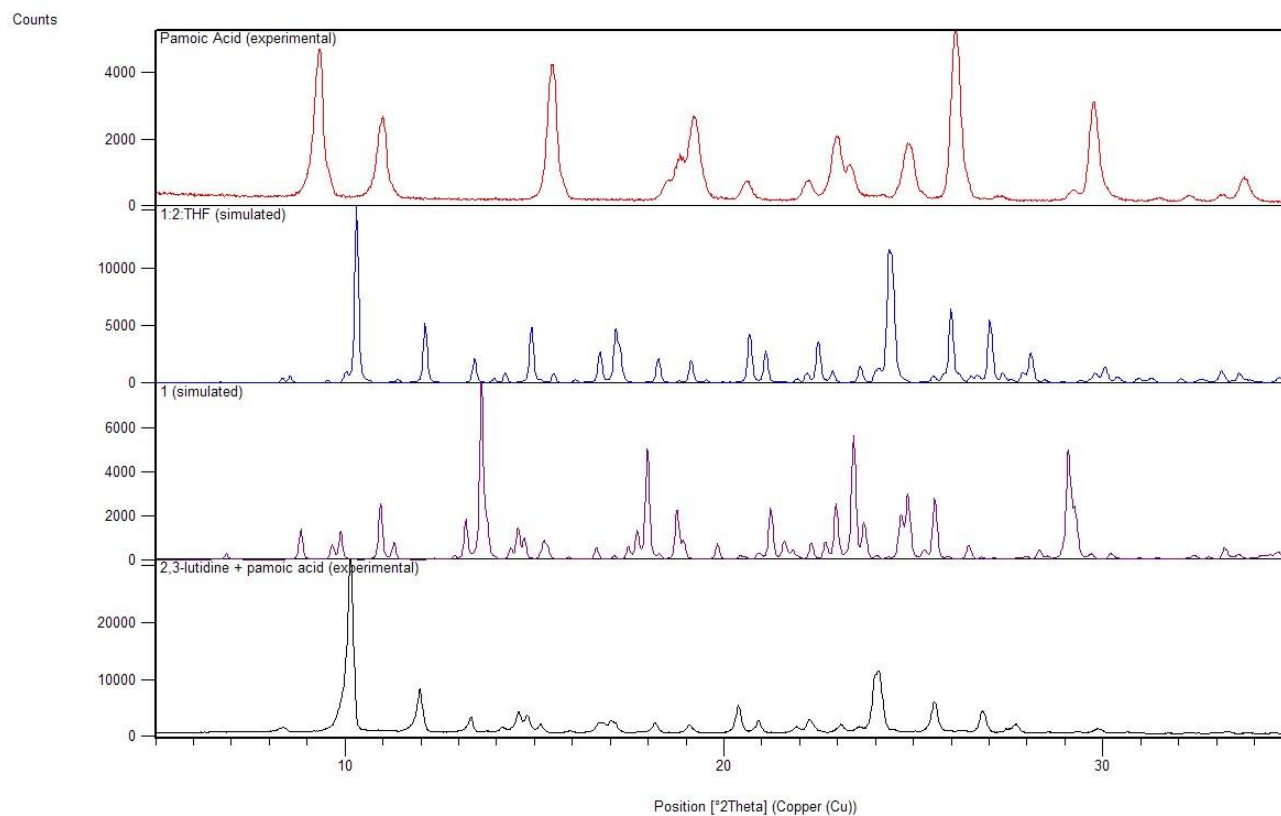
**Table 1** Summary of results obtained in this study. CSD refcodes are given for published structures. Numbers in bold relate to crystal structures described in the text. Products highlighted in blue indicate those cases where a different product than that obtained from pure solvent was observed.

| Solvent                       | Isomers of lutidine or picoline                                  |                                              |                              |                                    |                                                                 |                 |                                             |                                                 |                                                |
|-------------------------------|------------------------------------------------------------------|----------------------------------------------|------------------------------|------------------------------------|-----------------------------------------------------------------|-----------------|---------------------------------------------|-------------------------------------------------|------------------------------------------------|
|                               | 2,3-lutidine                                                     | 2,4-lutidine                                 | 2,5-lutidine                 | 2,6-lutidine                       | 3,4-lutidine                                                    | 3,5-lutidine    | 2-picoline                                  | 3-picoline                                      | 4-picoline                                     |
| THF:H <sub>2</sub> O<br>(1:1) | 1:2:THF<br>type <b>B</b><br>1:1:THF<br>type <b>A</b><br><b>1</b> | <b>1:2:2</b><br><b>dihydrate</b><br><b>2</b> | 1:1:THF<br>type <b>A</b>     | 1:1:THF<br>JAWXOV<br>type <b>A</b> | <b>1:1:1:1/2</b><br><b>hydrate</b><br>(ref. 6)                  | 1:1<br>JAWYAI   | 1:1:THF<br>type <b>A</b>                    | <b>1:1:1:1/2</b><br><b>hydrate</b><br><b>3*</b> | <b>1:1:1:1/2</b><br><b>hydrate</b><br><b>4</b> |
| DMF:H <sub>2</sub> O<br>(1:1) | 1:2:1<br><b>1:1</b><br><b>5</b>                                  | 1:1:DMF                                      | Pamoic acid<br>DMF solvate** | Pamoic acid<br>DMF solvate**       | 1:1:DMF<br>(PXRD matches<br>experimentally<br>obtained pattern) | 1:1:DMF         | Pamoic acid<br>DMF solvate                  | Pamoic acid<br>DMF solvate                      | Pamoic acid<br>DMF solvate                     |
| NMP:H <sub>2</sub> O<br>(1:1) | 1:1:NMP                                                          | 1:1:NMP                                      | channel<br>(ref. 6)          | Pamoic acid<br>NMP solvate         | channel**<br>(ref. 6)                                           | 1:1<br>JAWYAI** | <b>1:1:NMP</b><br><b>type A</b><br><b>6</b> | <b>channel</b><br>(ref. 6)                      | <b>channel**</b>                               |

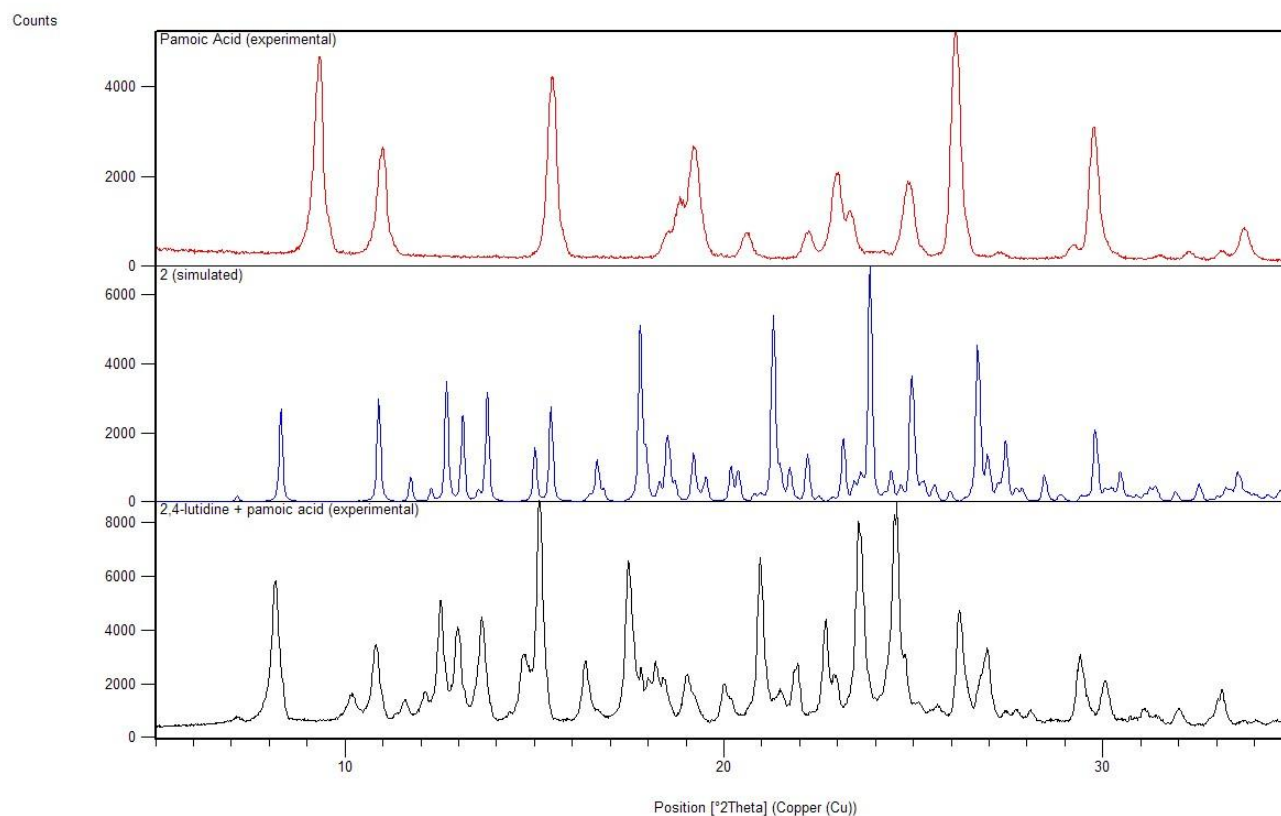
\* Reaction of 3-picoline with pamoic acid in 1:1 THF:H<sub>2</sub>O gave no solid product. This hydrate was obtained from wet THF on two occasions. Attempts to crystallise this material from a range of THF:H<sub>2</sub>O ratios also yielded no solid product.

\*\* For each of these materials, unit cells from several crystals of the material obtained indicated the product listed in the table. PXRD patterns indicated an unidentified mixture of products.

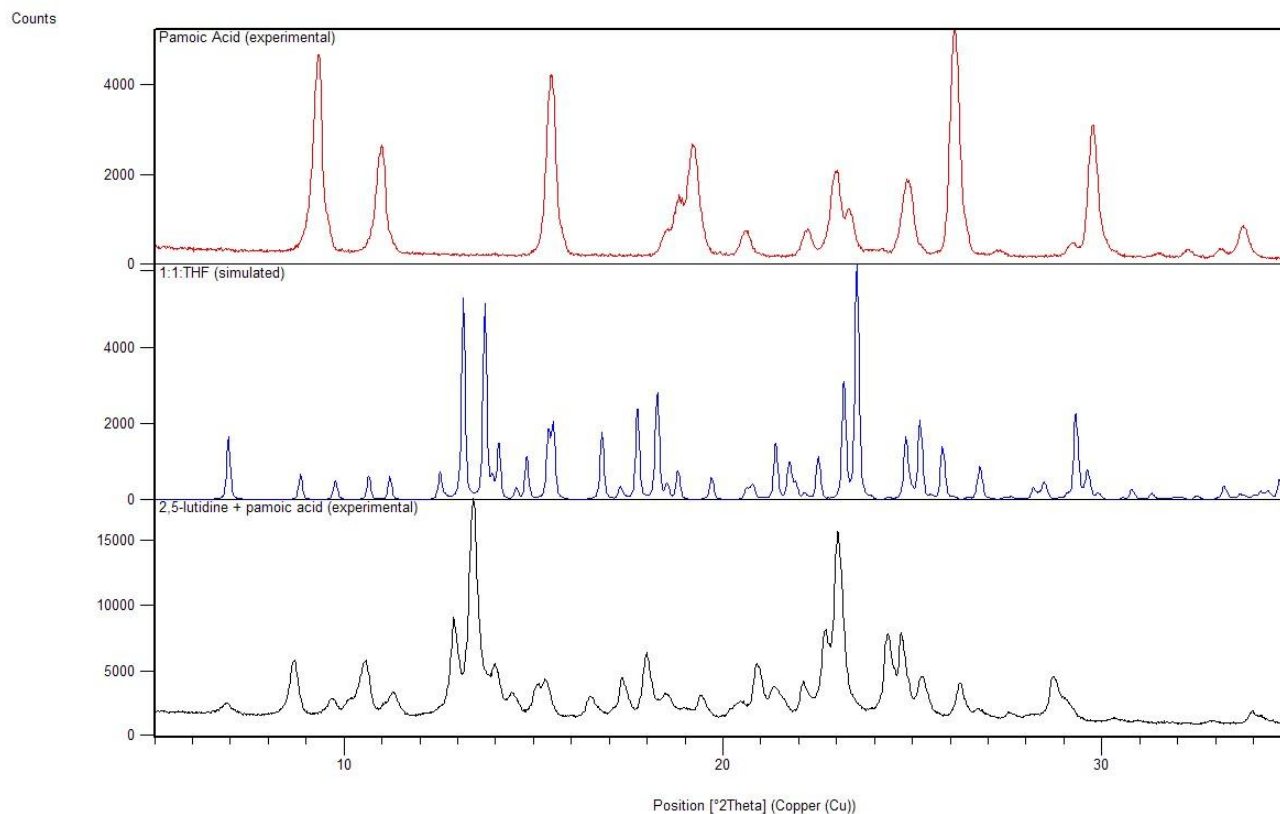
Reactions carried out in 1:1 THF:water (Figures S1-S8)



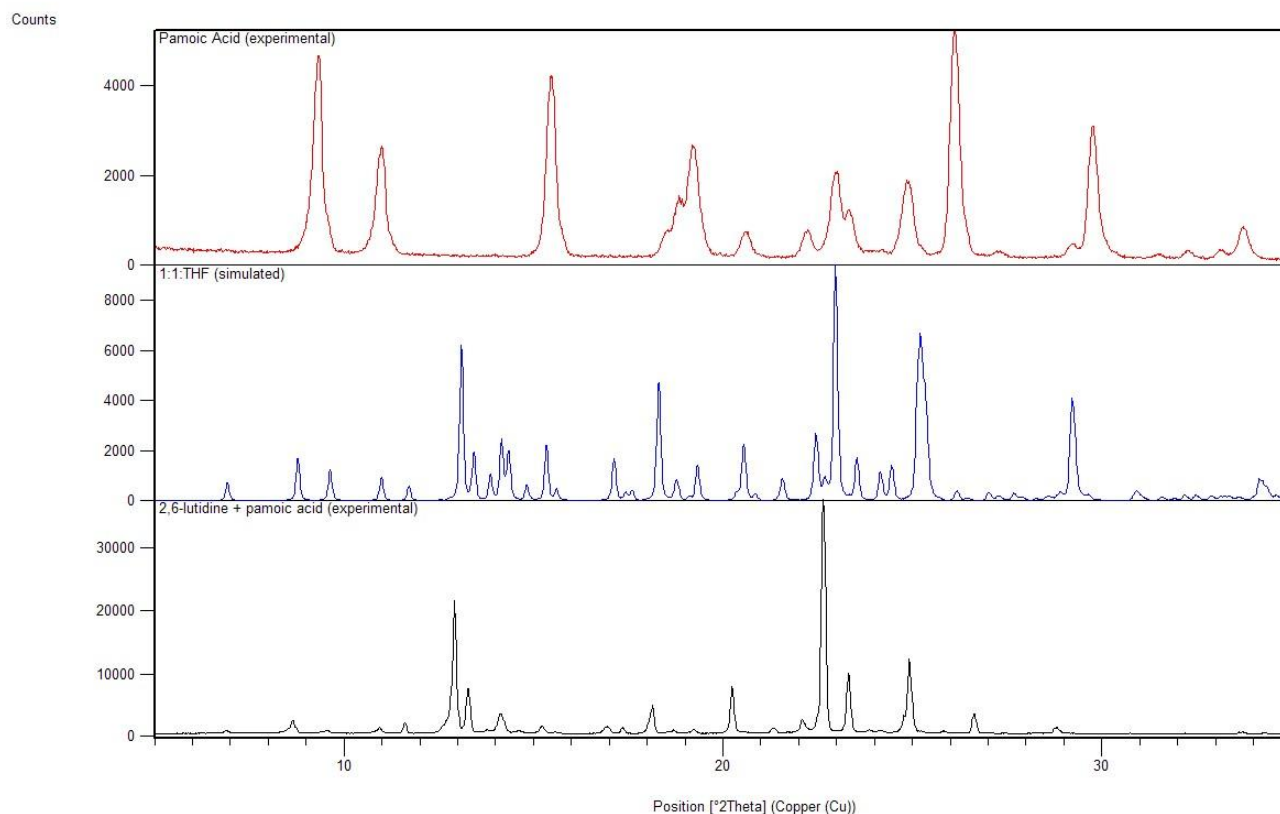
**Fig. S1** PXRD patterns for reaction of 2,3-lutidine with pamoic acid in 1:1 THF:water, confirming that the product obtained is the 1:2:THF salt (structure type **B**).



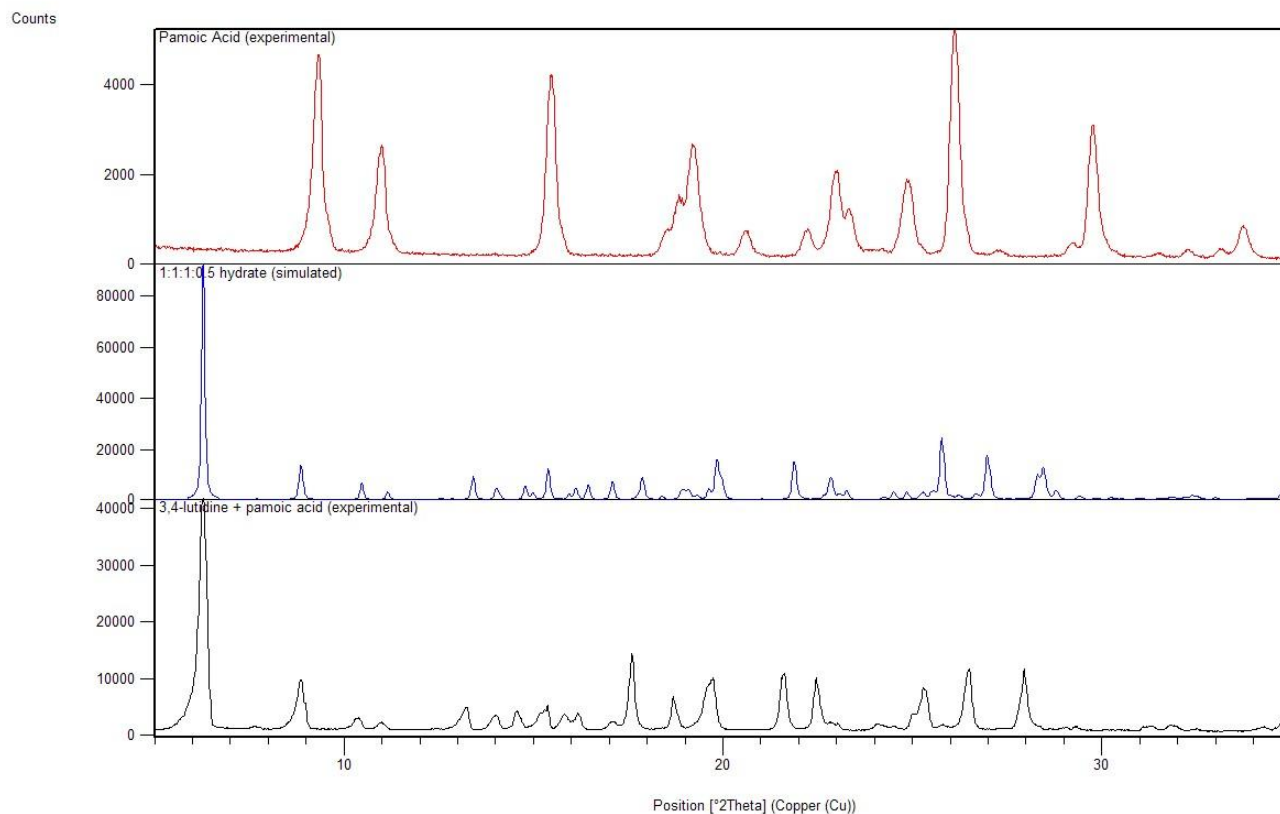
**Fig. S2** PXRD patterns for reaction of 2,4-lutidine with pamoic acid in 1:1 THF:water, confirming that the product obtained is **2**.



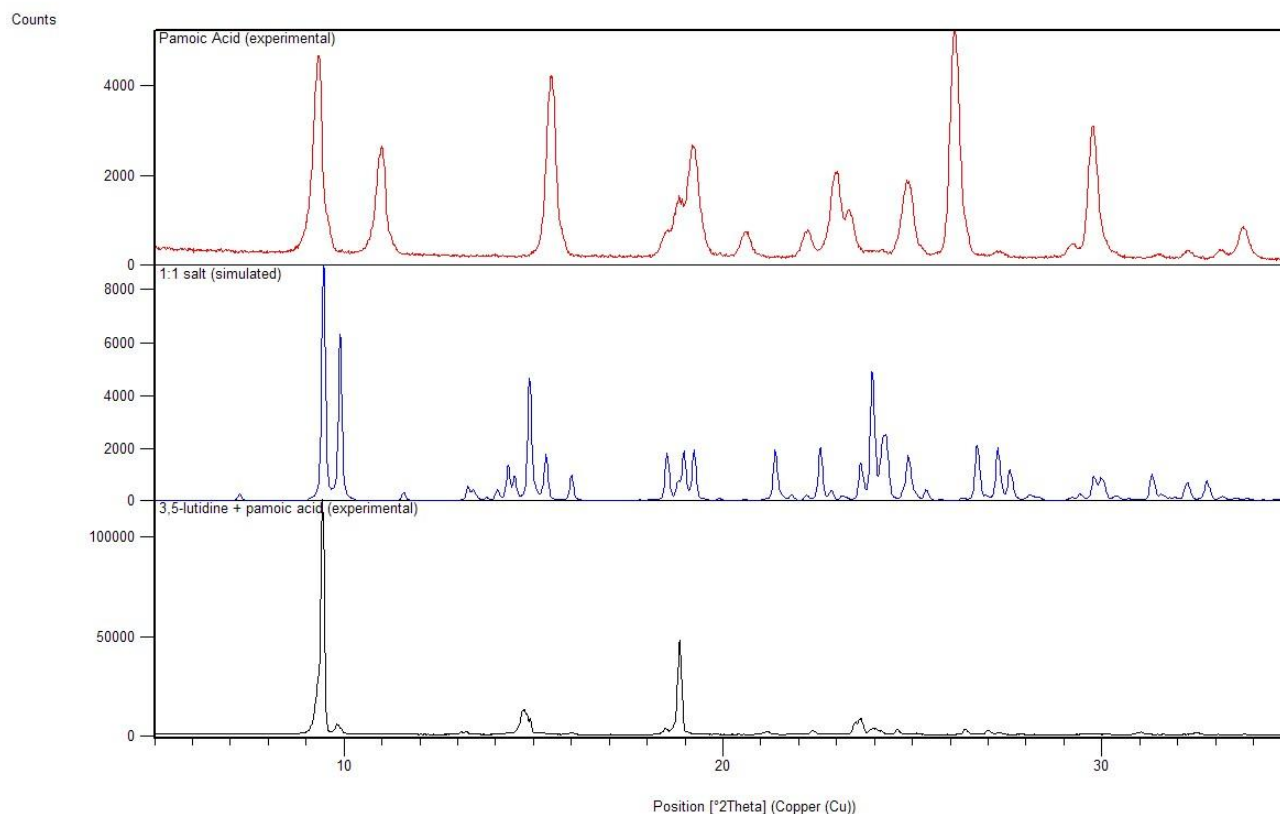
**Fig. S3** PXRD patterns for reaction of 2,5-lutidine with pamoic acid in 1:1 THF:water, confirming that the product obtained is 1:1:THF (type A).



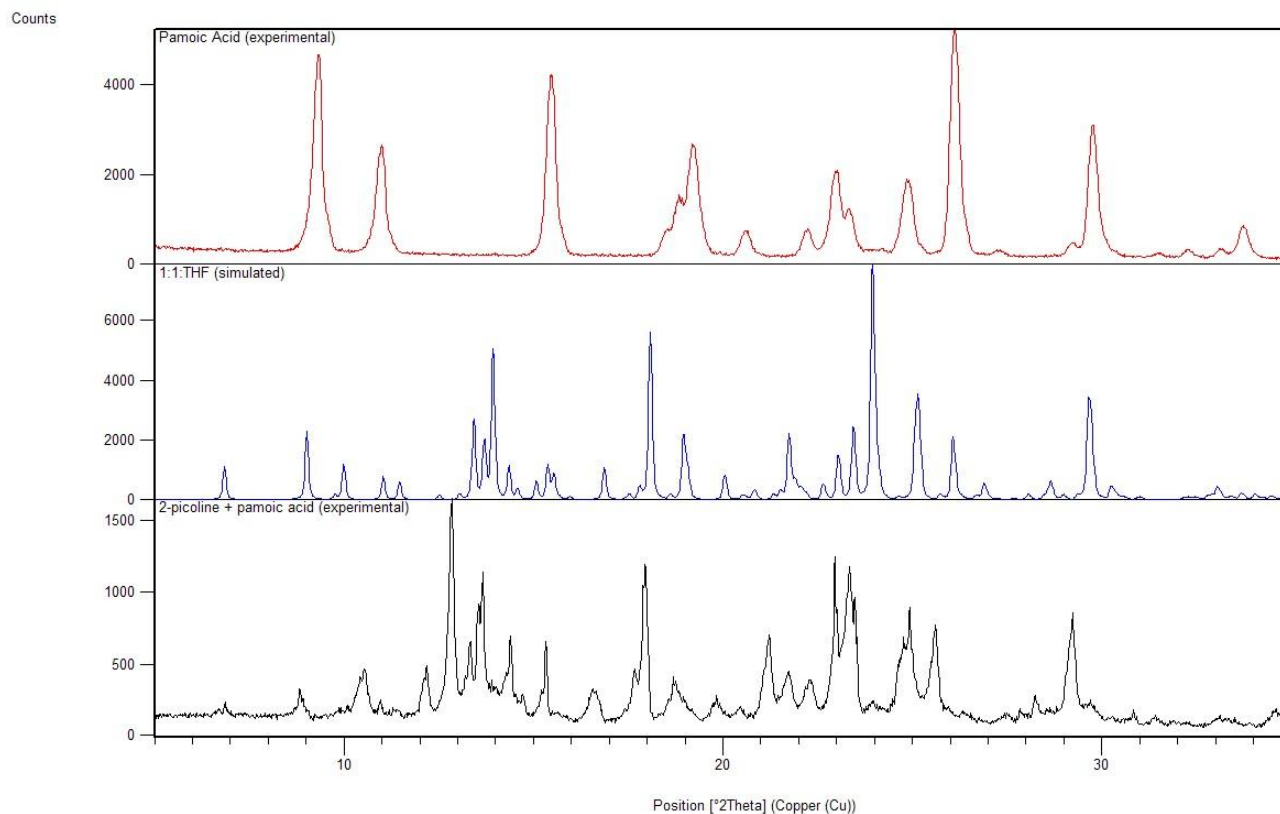
**Fig. S4** PXRD patterns for reaction of 2,6-lutidine with pamoic acid in 1:1 THF:water, confirming that the product obtained is 1:1:THF (type A).



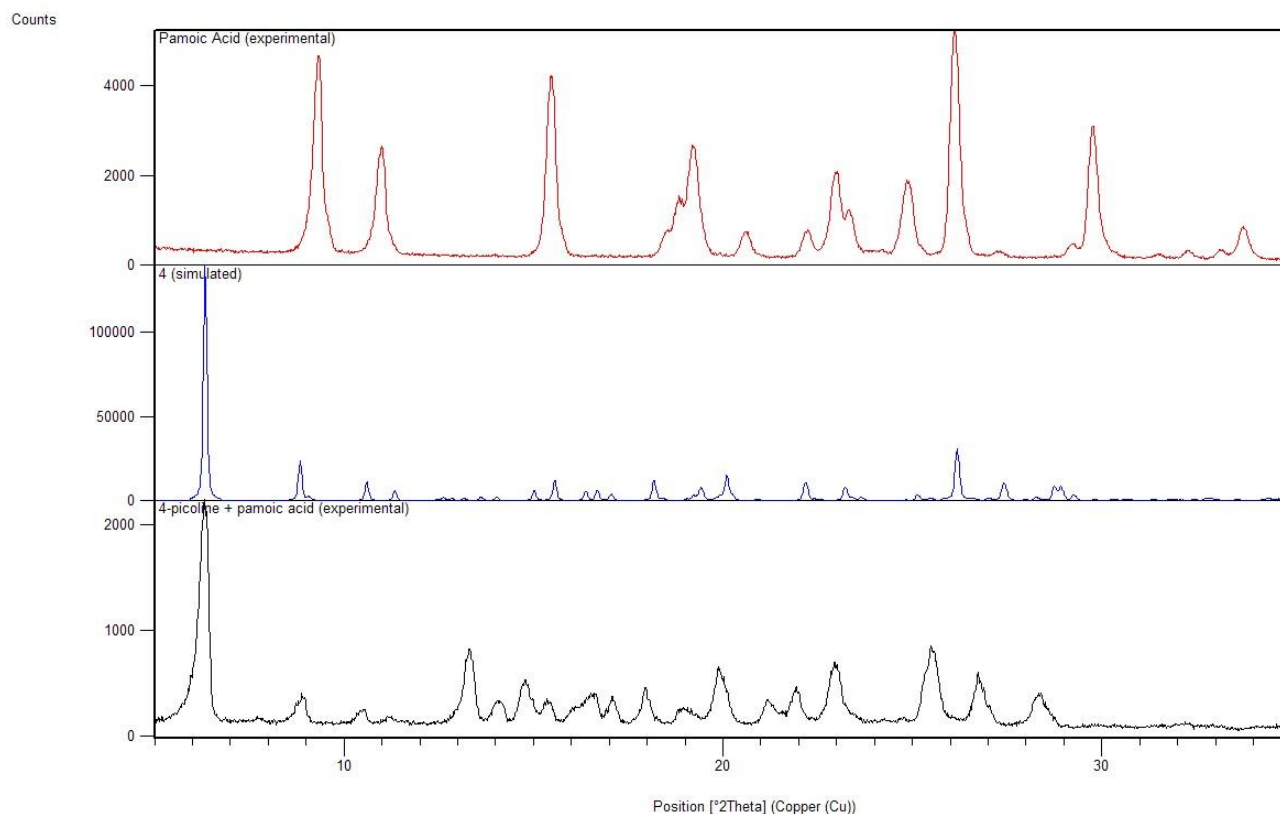
**Fig. S5** PXRD patterns for reaction of 3,4-lutidine with pamoic acid in 1:1 THF:water, confirming that the product obtained is the 1:1:1:0.5 hydrate.



**Fig. S6** PXRD patterns for reaction of 3,5-lutidine with pamoic acid in 1:1 THF:water, confirming that the product obtained is the 1:1 salt.

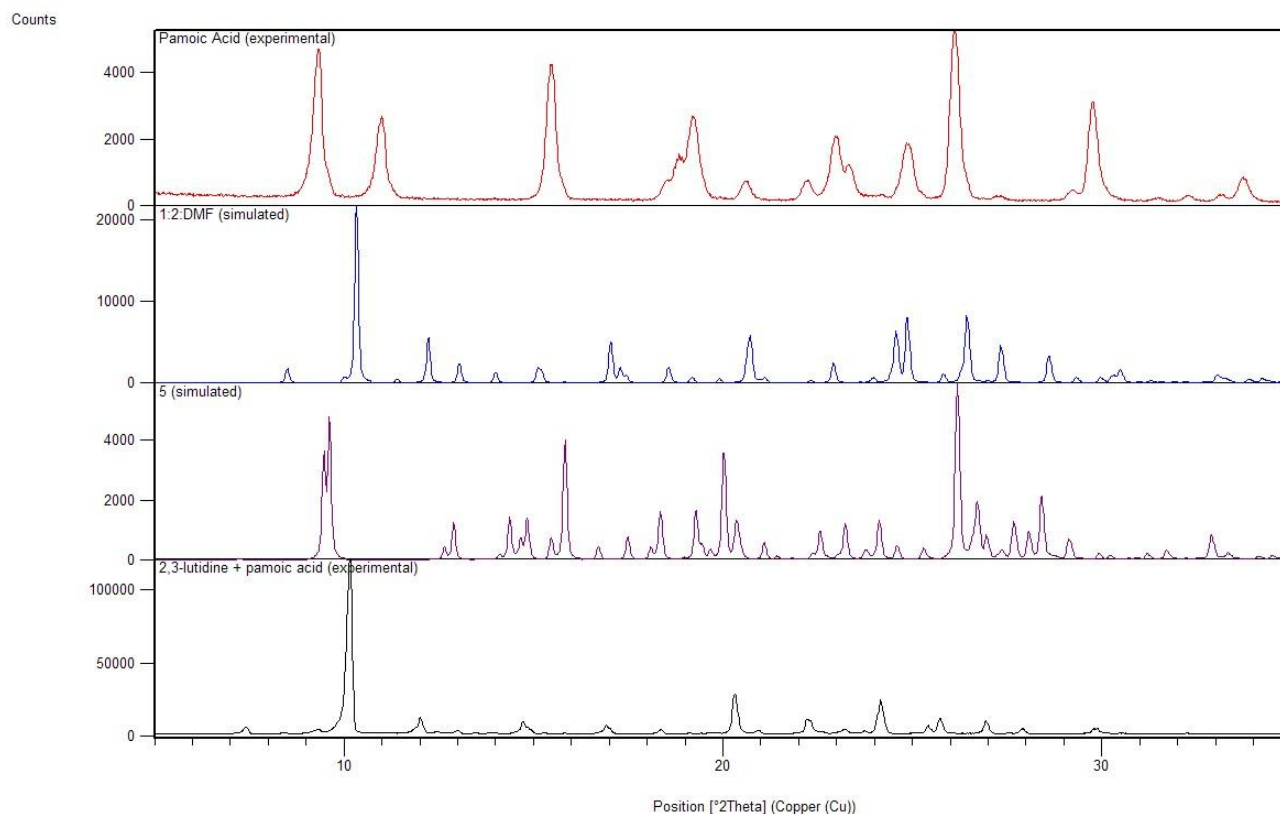


**Fig. S7** PXRD patterns for reaction of 2-picoline with pamoic acid in 1:1 THF:water, confirming that the product obtained is 1:1:THF (type A).

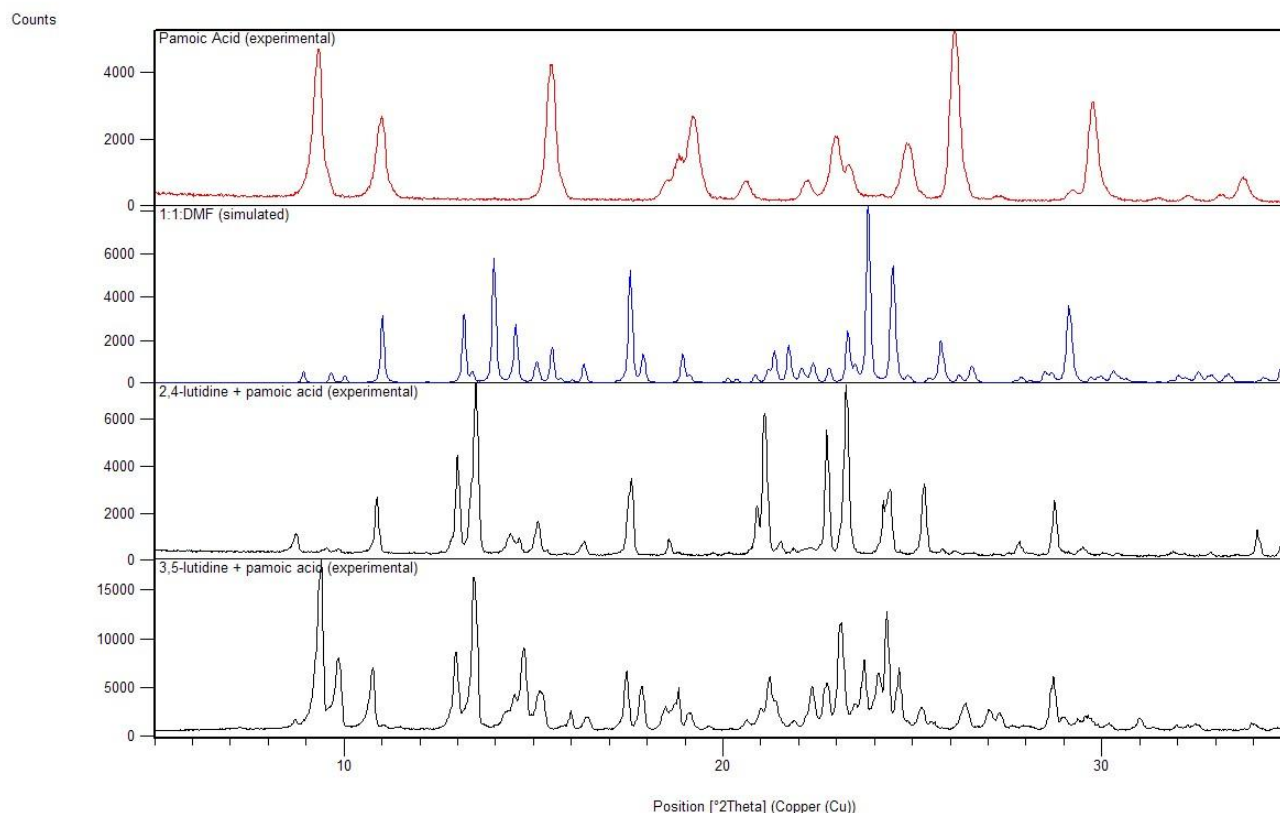


**Fig. S8** PXRD patterns for reaction of 4-picoline with pamoic acid in 1:1 THF:water, confirming that the product obtained is 4.

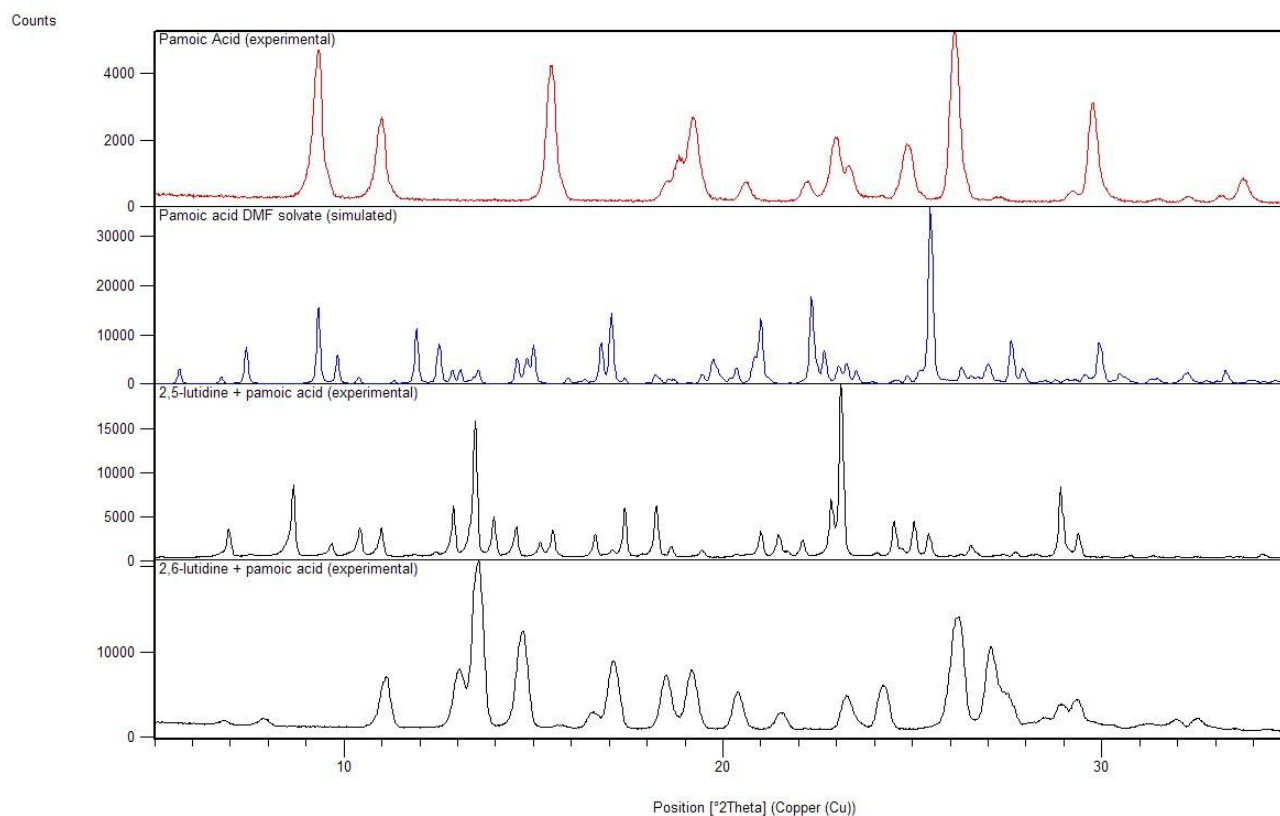
# Reactions carried out in 1:1 DMF:water (Figures S9-S13)



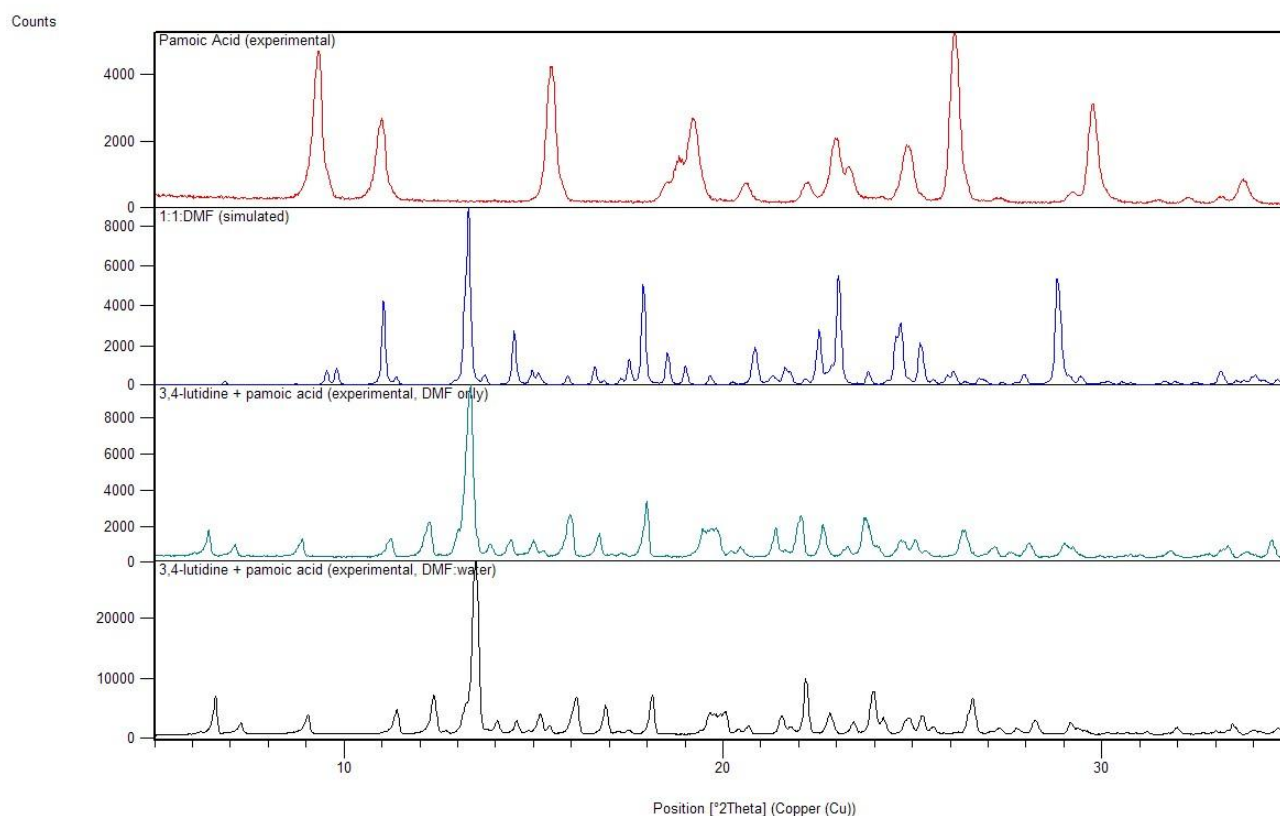
**Fig. S9** PXRD patterns for reaction of 2,3-lutidine with pamoic acid in 1:1 DMF:water, confirming that the product obtained is the 1:2:DMF solvate.



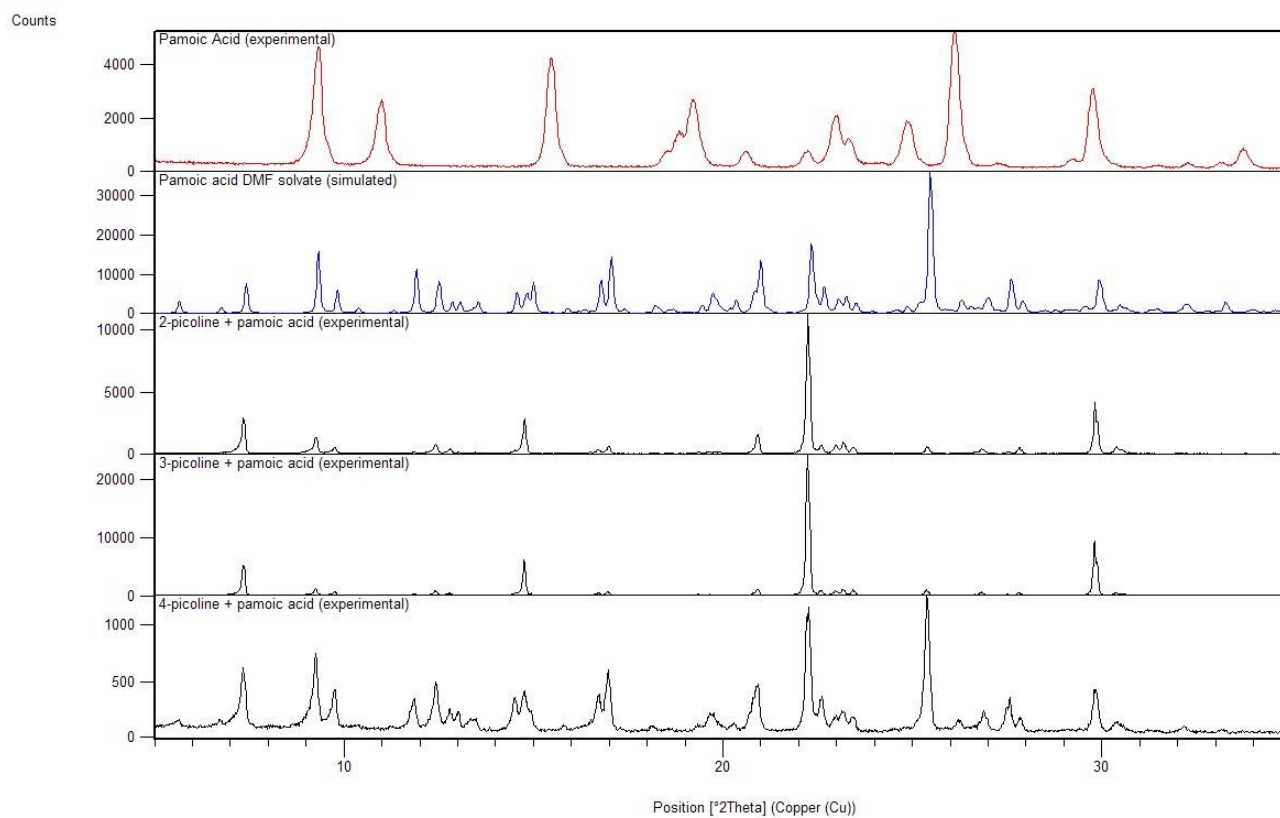
**Fig. S10** PXRD patterns for reaction of 2,4- and 3,5-lutidine with pamoic acid in 1:1 DMF:water, confirming that in both cases the product obtained contains the 1:1:DMF solvate.



**Fig. S11** PXRD patterns for reaction of 2,5- and 2,6-lutidine with pamoic acid in 1:1 DMF:water. The products obtained are clearly not the DMF solvate of DMF, despite crystals from each product having unit cell parameters matching this material.

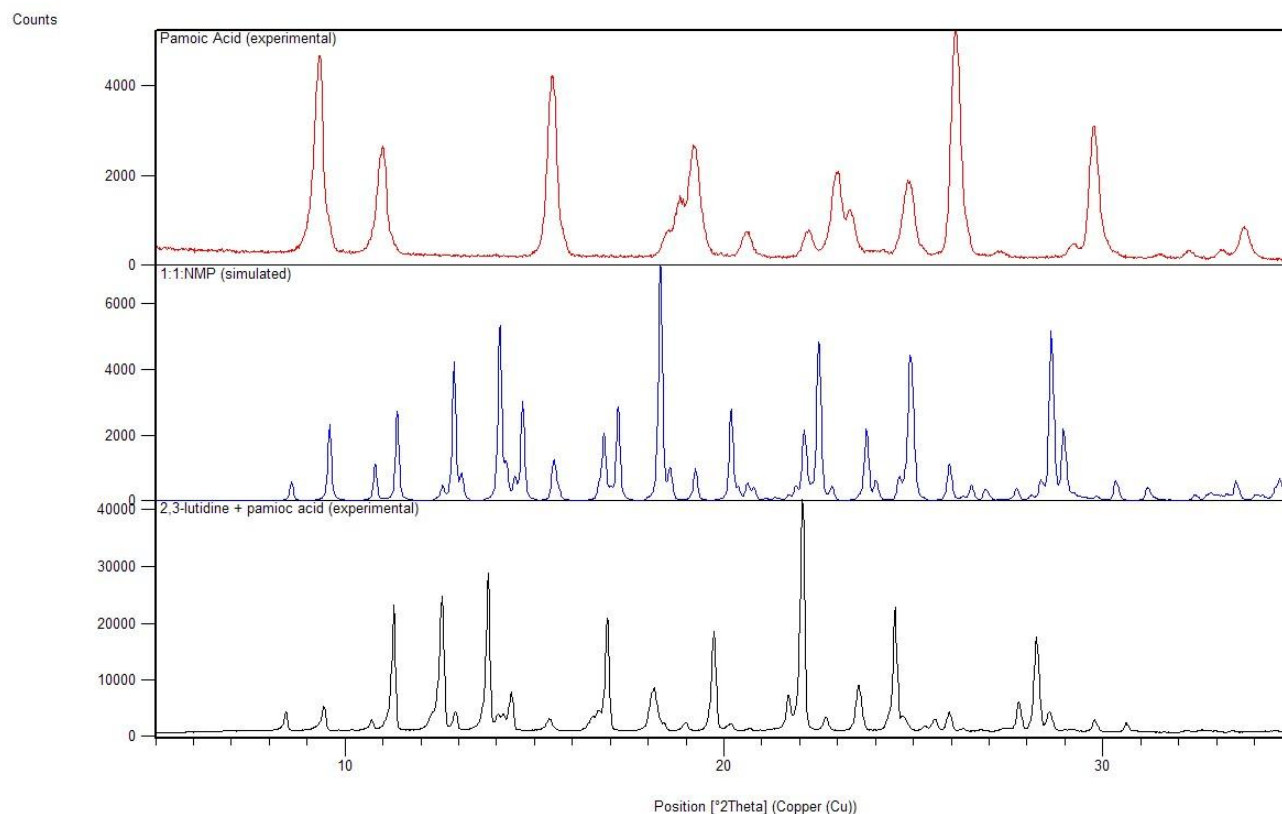


**Fig. S12** PXRD patterns for reaction of 3,4-lutidine with pamoic acid in 1:1 DMF:water, confirming that the product obtained has a powder pattern matching that obtained experimentally for the 1:1:DMF solvate.

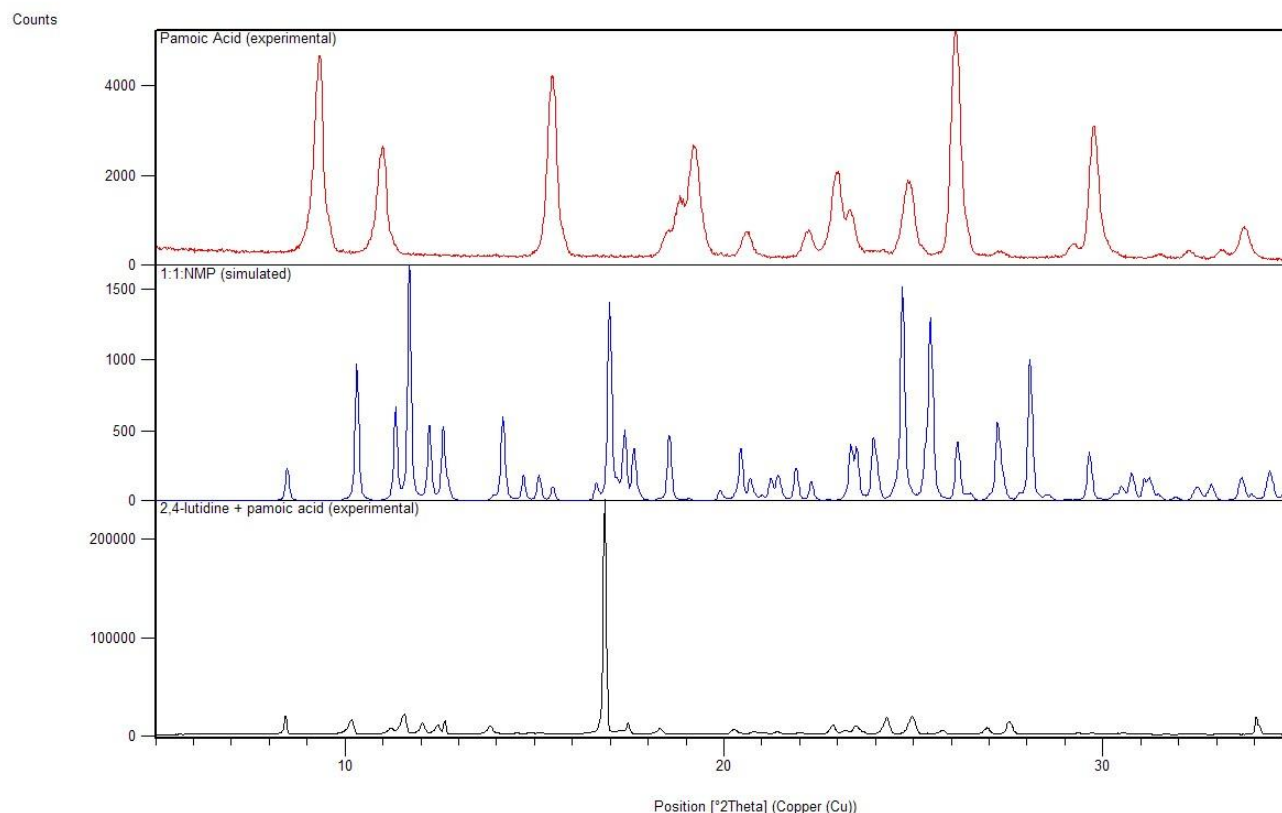


**Fig. S13** PXRd patterns for reaction of 2-, 3- and 4-picoline with pamoic acid in 1:1 DMF:water, showing that in each case the DMF solvate of pamoic acid was obtained.

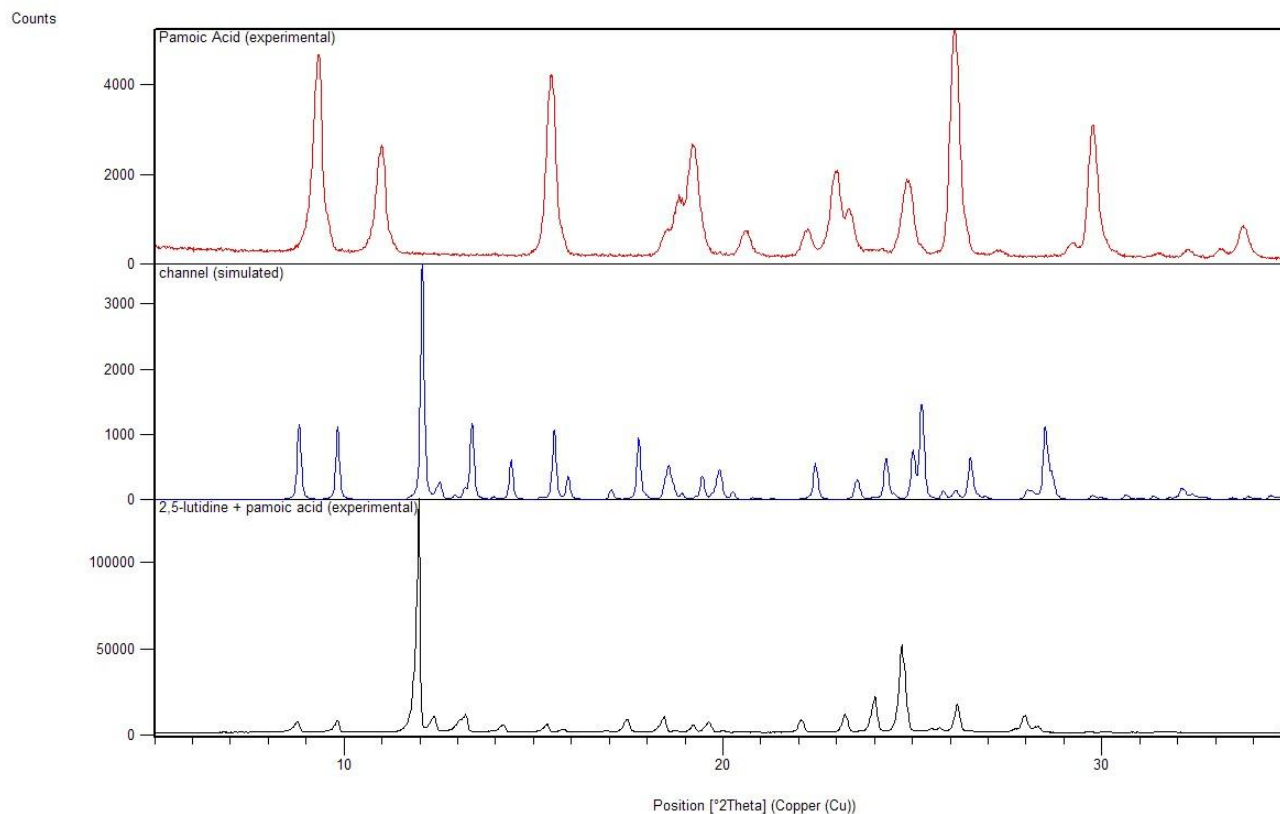
# Reactions carried out in 1:1 NMP:water (Figures S14-S20)



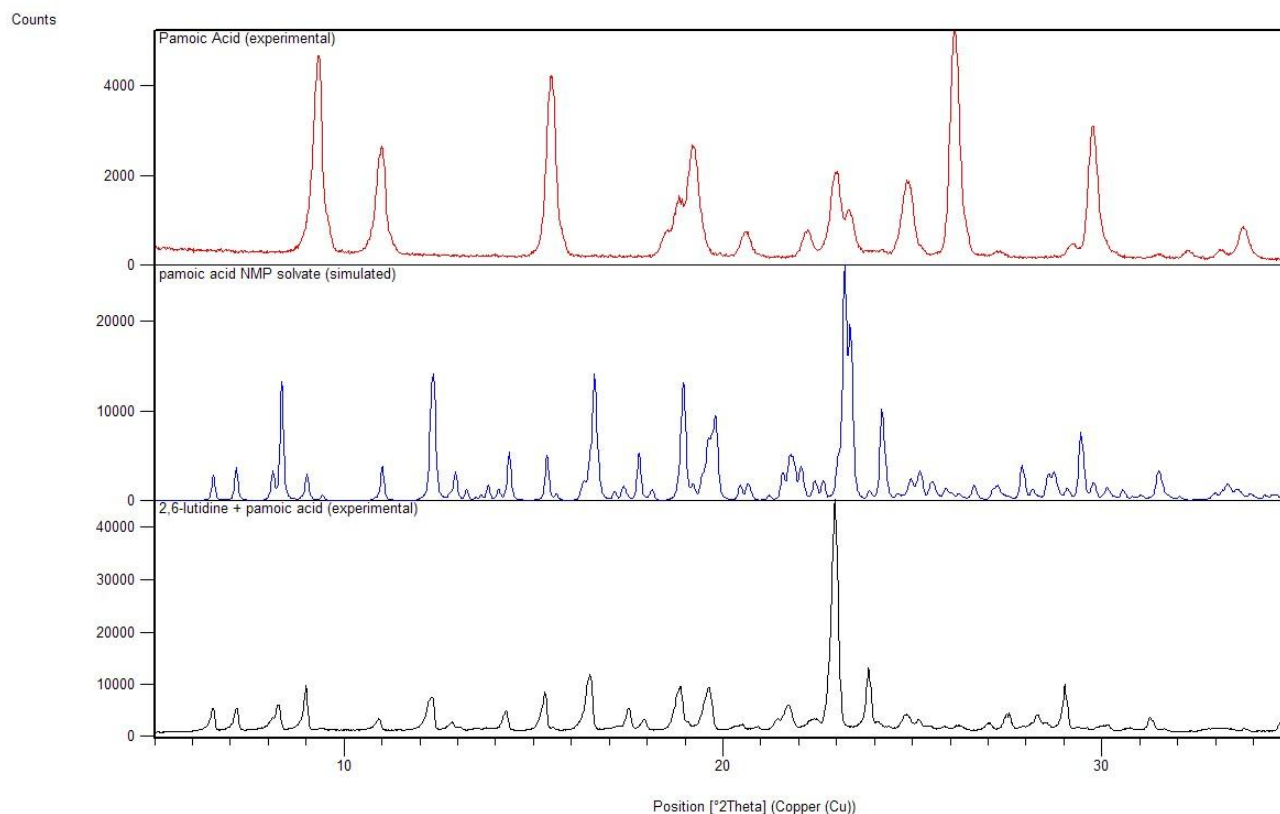
**Fig. S14** PXRD patterns for reaction of 2,3-lutidine with pamoic acid in 1:1 NMP:water, confirming that the product obtained is the 1:1:NMP solvate.



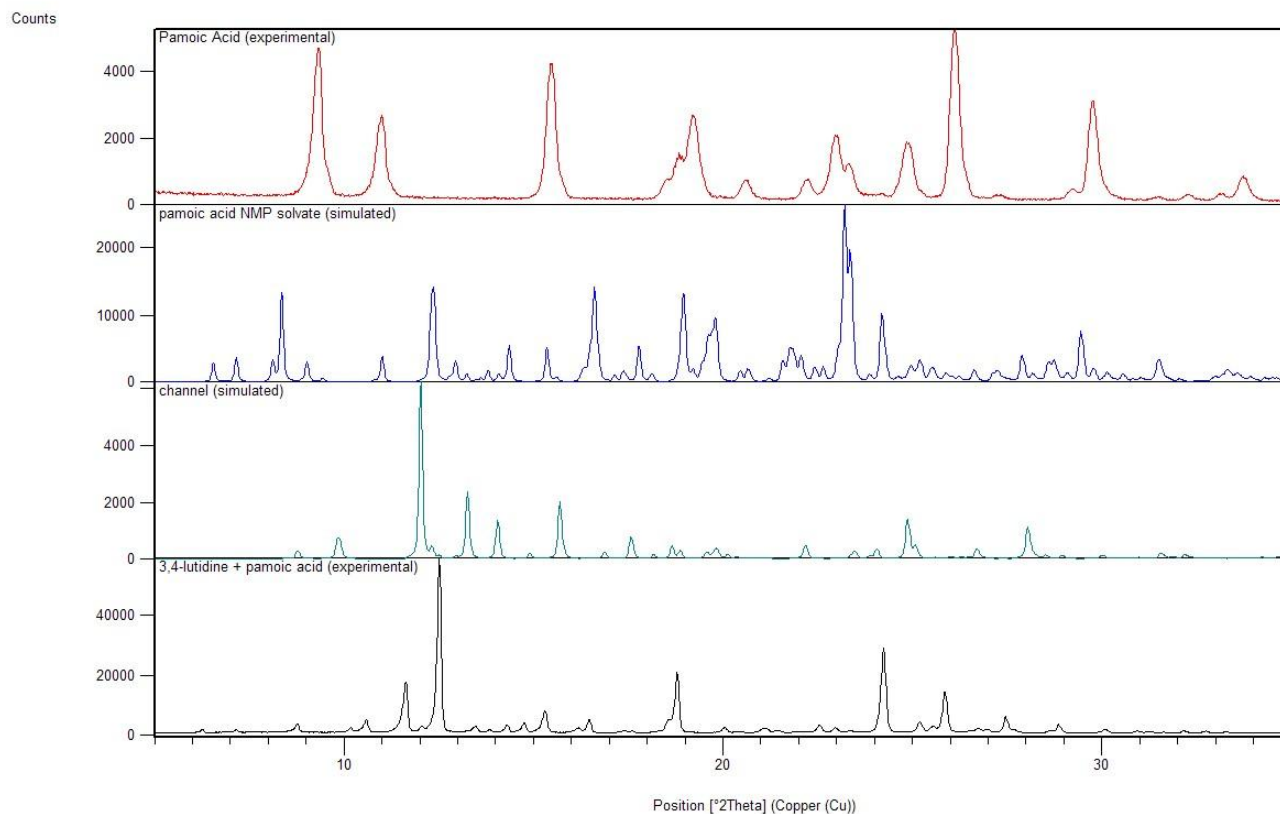
**Fig. S15** PXRD patterns for reaction of 2,4-lutidine with pamoic acid in 1:1 NMP:water, confirming that the product obtained is the 1:1:NMP solvate.



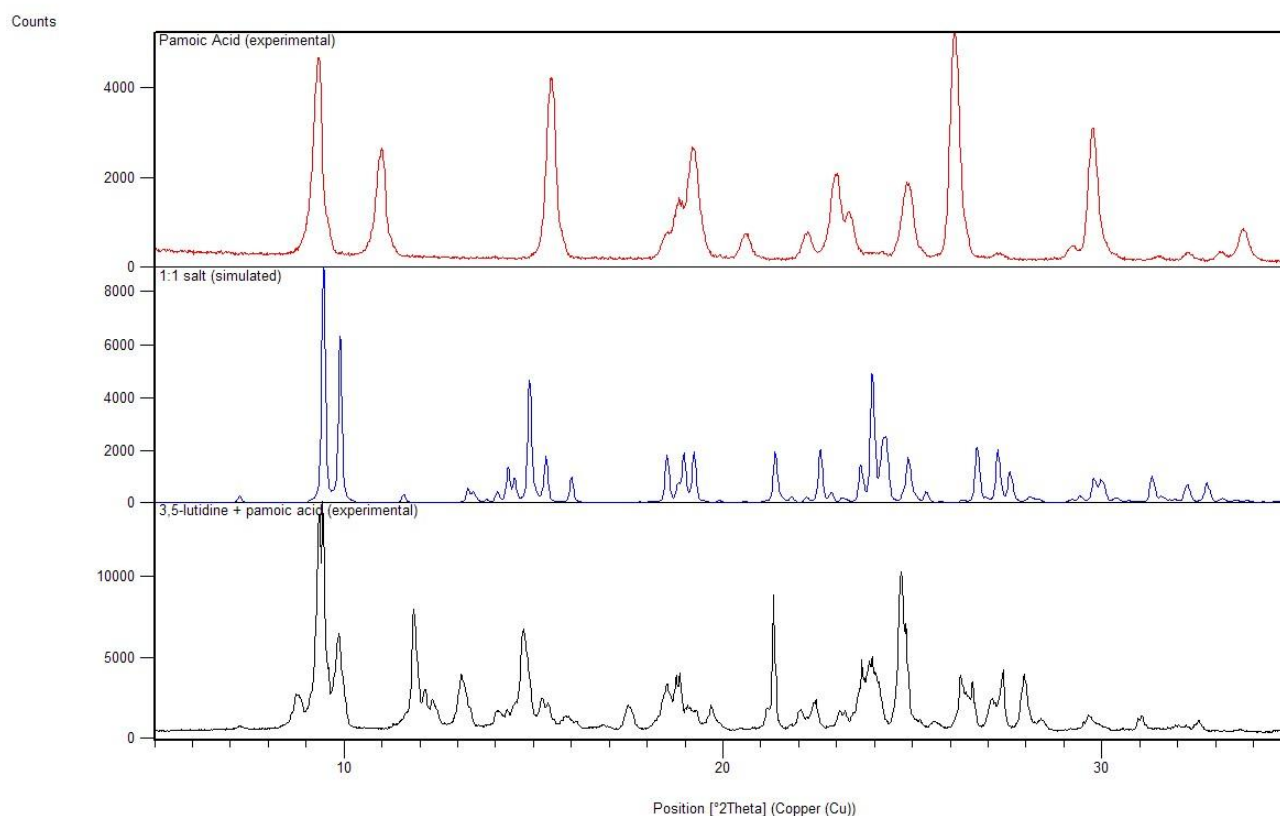
**Fig. S16** PXRD patterns for reaction of 2,5-lutidine with pamoic acid in 1:1 NMP:water, confirming that the product obtained is the channel-containing material.



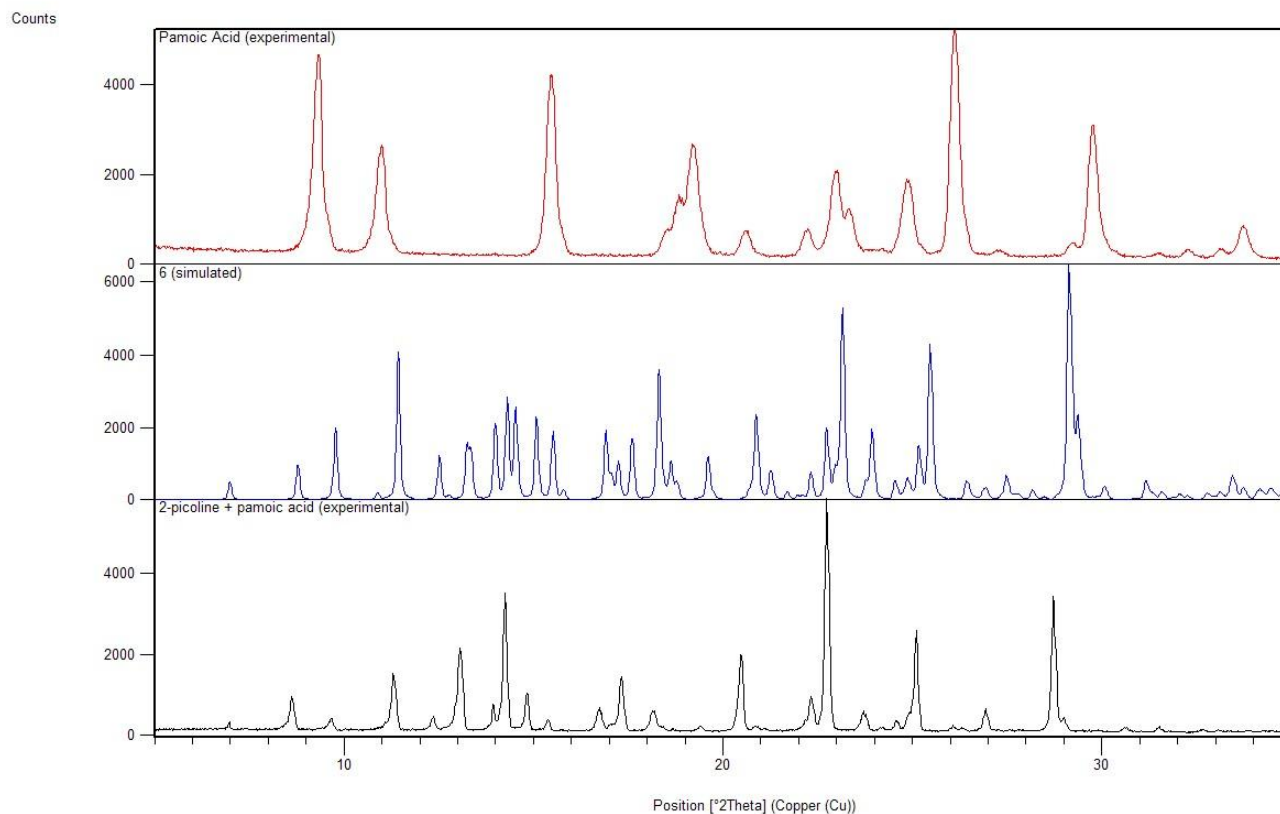
**Fig. S17** PXRD patterns for reaction of 2,6-lutidine with pamoic acid in 1:1 NMP:water, confirming that the product obtained is the NMP solvate of pamoic acid.



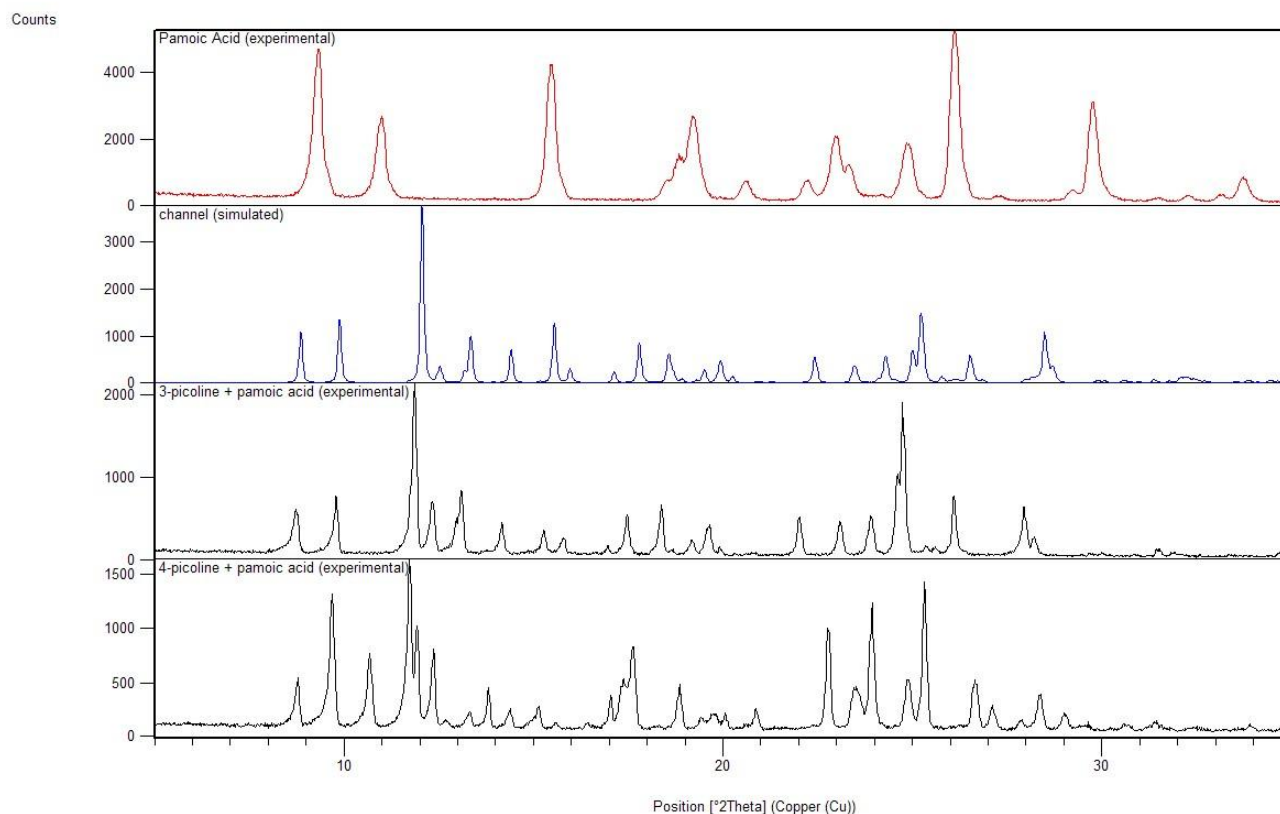
**Fig. S18** PXRD patterns for reaction of 3,4-lutidine with pamoic acid in 1:1 NMP:water, showing that the material obtained is a mixture of products.



**Fig. S19** PXRD patterns for reaction of 3,5-lutidine with pamoic acid in 1:1 NMP:water, showing that the material obtained contains the 1:1 salt.



**Fig. S20** PXRD patterns for reaction of 2-picoline with pamoic acid in 1:1 NMP:water, showing that the product obtained is **6**.



**Fig. S21** PXRD patterns for reaction of 3- and 4-picoline with pamoic acid in 1:1 NMP:water, confirming that the product obtained is the channel-containing material in both cases.

## Mechanochemical synthesis of hydrates

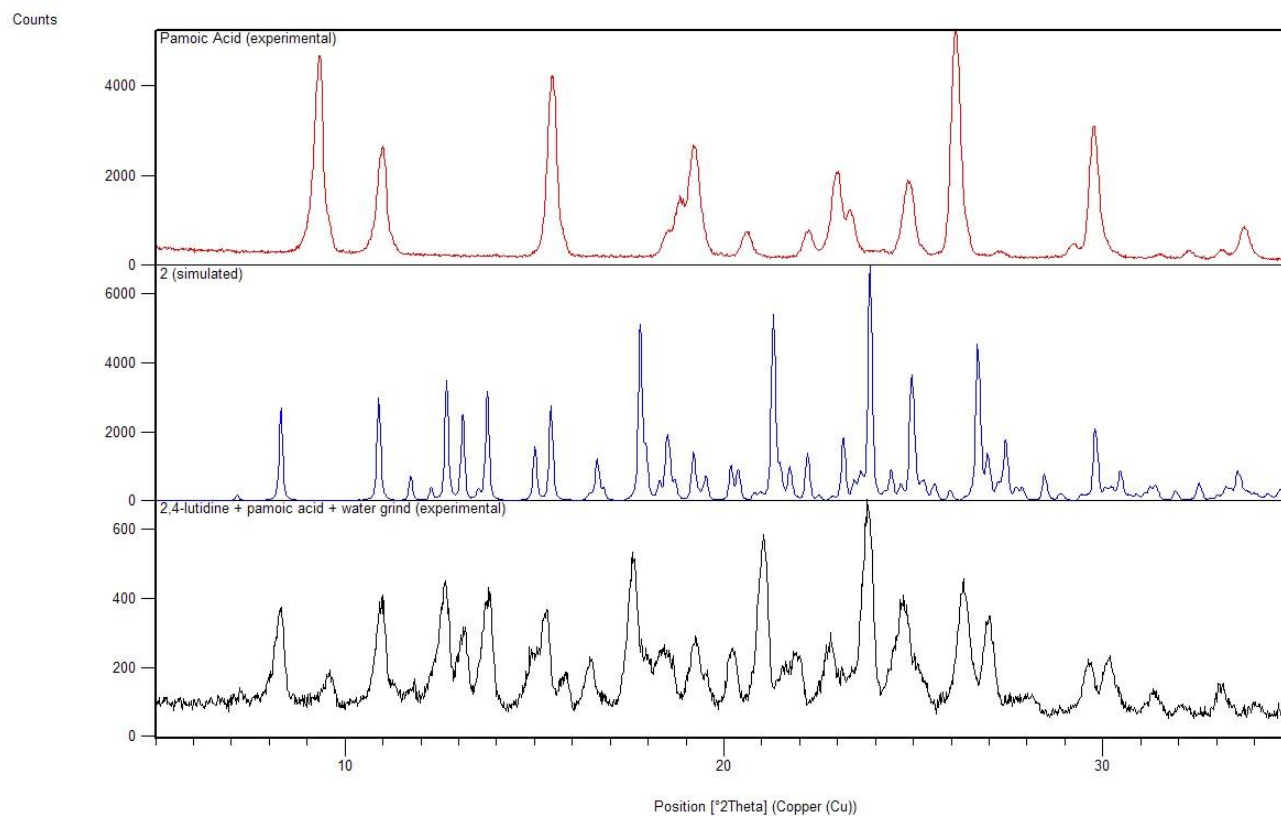


Fig. S22 PXRD patterns showing that grinding together 2,4-lutidine, pamoic acid and water in a 2:1:2 ratio yields the hydrate, 2.

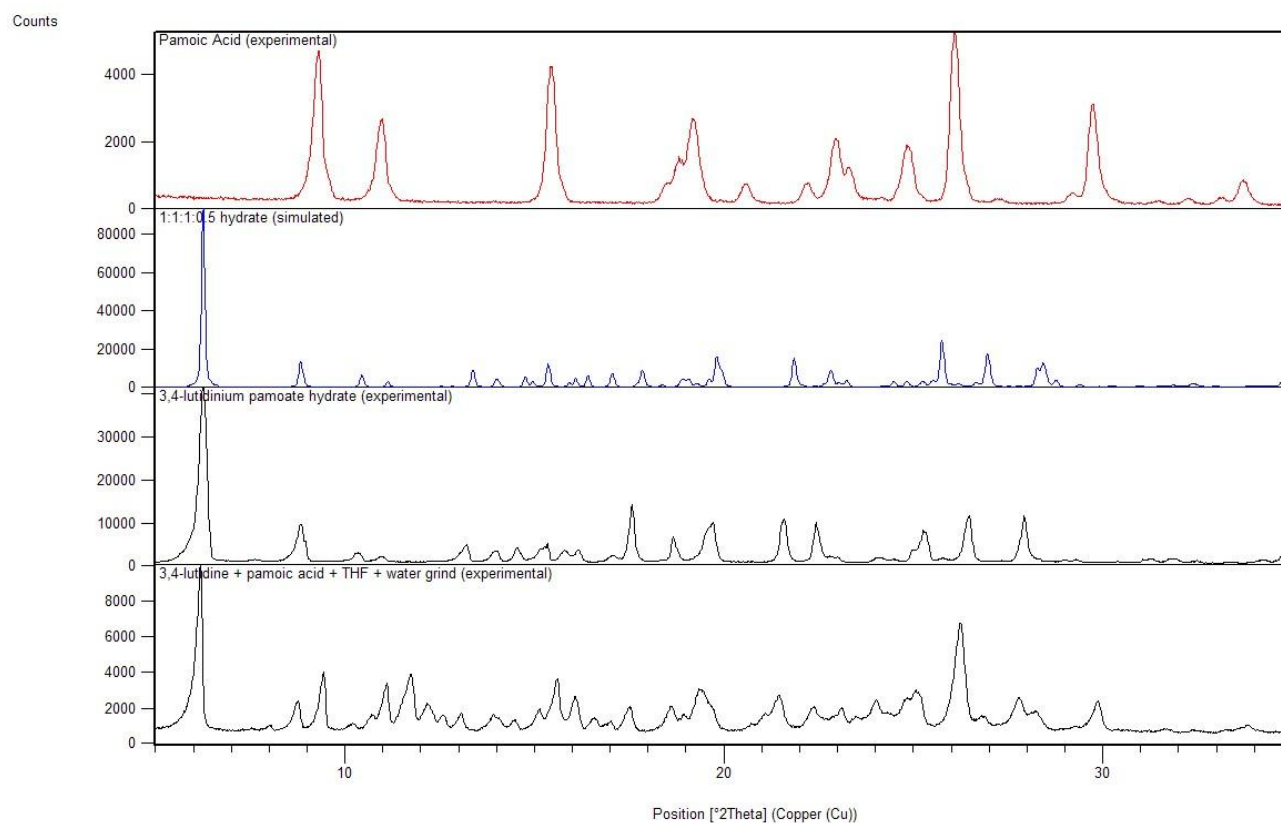


Fig. S23 PXRD patterns showing that grinding together 3,4-lutidine, pamoic acid, THF and water in a 1:1:1:0.5 ratio yields the hydrate.