# Electronic Supplementary Information (ESI)

## A Copper based Catalyst for Poly-Urethane synthesis from Discarded Motherboard

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### 1 Calculation of Acid value and Hydroxyl value

#### 1.1 Acid values of the bamboo polyol

Acid value of the prepared bamboo polyol is calculated according to a previously reported procedure and is subsequently used for determination of hydroxyl value.[1] 1 g bamboo-polyol sample is first mixed with 20 mL dioxane-water solution (4/1, v/v). The resulting mixture is titrated against 1 M NaOH till the pH reaches 8.3 to indicate the end-point.

#### 1.2 Calculation of Acid value of the bamboo polyol

$$Acid\ Value = (V_{NaOH(sample)} - V_{NaOH(blank)}) \times N_{NaOH} \times 56.1/W_{sample}$$

Where,

$V_{NaOH(sample)}$ = volume of NaOH standard solution consumed in sample titration (mL)

$V_{NaOH(blank)}$ = volume of NaOH standard solution consumed in blank titration (mL)

$W_{sample}$ = sample weight (g)

$N_{NaOH}$ = equivalent concentration of NaOH standard solution (M) = 1(M)

**Measurement result**

| n | Sample(g) | [$V_{NaOH(sample)}$-$V_{NaOH(blank)}$] (ml) | Acid Value(mg/g) |
|---|---|---|---|
| 1. | 1.0001 | 0.4 | **16.83** |
| 2. | 1.0003 | 0.3 | |
| 3. | 1.0004 | 0.3 | |

**1.3 Hydroxyl value of bamboo polyol**

Phthalic anhydride solution is prepared by dissolving 150 g phthalic anhydride in a 1 L mixture of dioxane and pyridine (9/1, v/v). 10 mL of the phthalic anhydride solution is mixed with 1 g of polyol sample and the final mixture is added into a 150 mL beaker covered with aluminum foil. The beaker is put into a boiling water bath for 20 min. After cooling it down, 20 mL of dioxane-water solution (4/1, v/v) and 5 mL of water are added to the beaker. The resulting mixture is titrated against 1 M NaOH till the pH reaches pH 8.3 to indicate the end-point. Blank titration is conducted using the same procedure.

**1.4 Calculation of Hydroxyl value of the bamboo polyol**

$$Hydroxyl\ value = \left(V_{NaOH(blank)} - V_{NaOH(sample)}\right) \times N_{NaOH} \times \frac{56.1}{W_{sample}} + Acid\ value$$

Where,

$V_{NaOH(sample)}$ = volume of NaOH standard solution consumed in sample titration (mL)

$V_{NaOH(blank)}$ = volume of NaOH standard solution consumed in blank titration (mL)

$W_{sample}$ = sample weight (g)

$N_{NaOH}$ = equivalent concentration of NaOH standard solution (M).

**Measurement result**

| n | Sample(g) | $[V_{NaOH(blank)}-V_{NaOH(NaOH)}]$ (ml) | Hydroxyl Value(mg/g) |
|---|---|---|---|
| 1. | 1.0000 | 3.0 | **185.13** |
| 2. | 1.0003 | 3.0 | |
| 3. | 1.0002 | 3.0 | |

**2 TGA data of DBSNa and Cu-based catalyst**

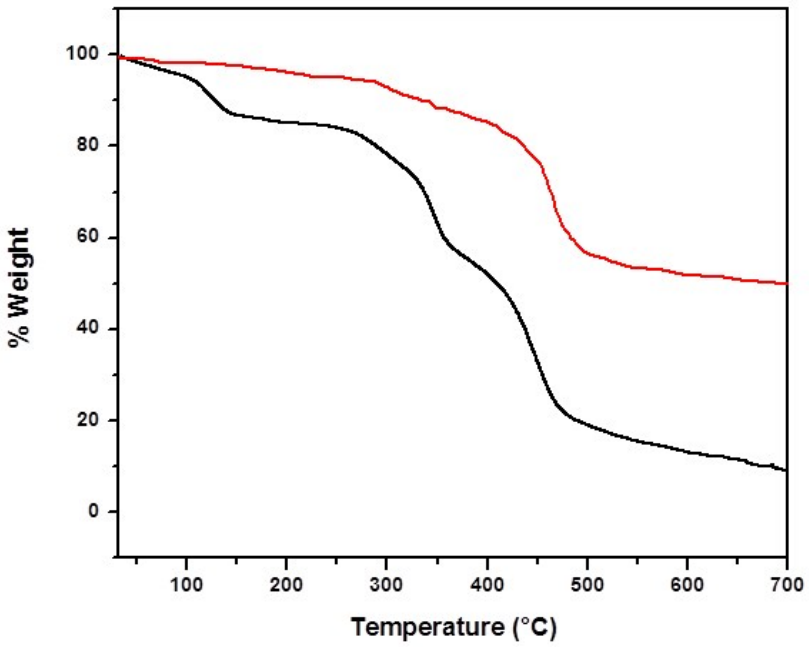


**Fig. S1** TGA measurements of DBSNa (in red) and Cu-based catalyst (in black).

**3 Model reactions with IPDI and Benzyl alcohol**

**3.1 Preparation of Benzyl((5-(((benzyloxy)carbonyl)amino)-1,3,3 trimethylcyclohexyl)methyl)carbamate**

In a 50 ml round bottom flask, IPDI (1 mmol) and Benzyl alcohol (2.2 mmol) was taken and dissolved in 10 ml acetonitrile. Then Cu-based catalyst (5 mol%) was added to the solution

and heated at $60^0$ C. The progress of the reaction was controlled by TLC. Product was separated by column chromatography with 5% EtOAc in hexane as eluent.

$^1$H NMR (400 MHz, $CDCl_3$): δ = 7.53-7.49 (m, 1H), 7.3 (m, 10H), 7.21-7.18 (m, 1H), 4.61 (s, 4H), 4.14-4.10 (m, 1H), 3.18 (m, 2H), 1.08-1.04 (m, 6H), 1.02-0.89 (m. 9H).

$^{13}$C NMR (100 MHz, $CDCl_3$): δ = 156.8, 155.6, 140.8, 128.3, 127.9, 126.7, 64.7, 54.6, 46.7, 44.4, 36.1, 34.8, 31.5, 27.3, 22.9, 13.9

## Table S1

| IPDI | Benzyl Alcohol | Catalyst used | Amount of catalyst used | Reaction has occurred (Yes/No) | Time (h) | Yield (%) |
|---|---|---|---|---|---|---|
| 1mmol | 2.2 mmol | DBSNa | 5mol% | No | NA | NA |
| 1mmol | 2.2 mmol | Cu Powder | 5mol% | Yes | 18 | 63 |
| 1mmol | 2.2mmol | Cu-based Catalyst | 5mol% | Yes | 6 | 85 |

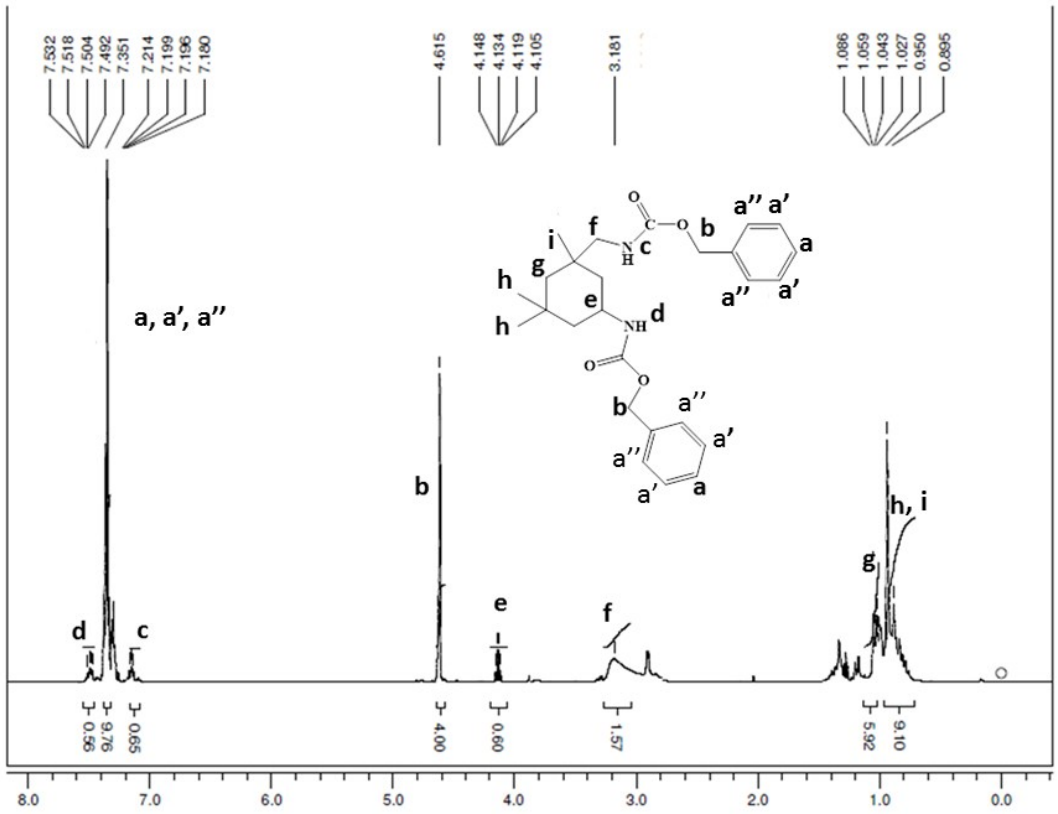


**Fig. S2** $^{1}H$ NMR Spectra ($CDCl_3$, $25^0C$) of Benzyl((5-(((benzyloxy)carbonyl)amino)-1,3,3 trimethylcyclohexyl)methyl)carbamate.

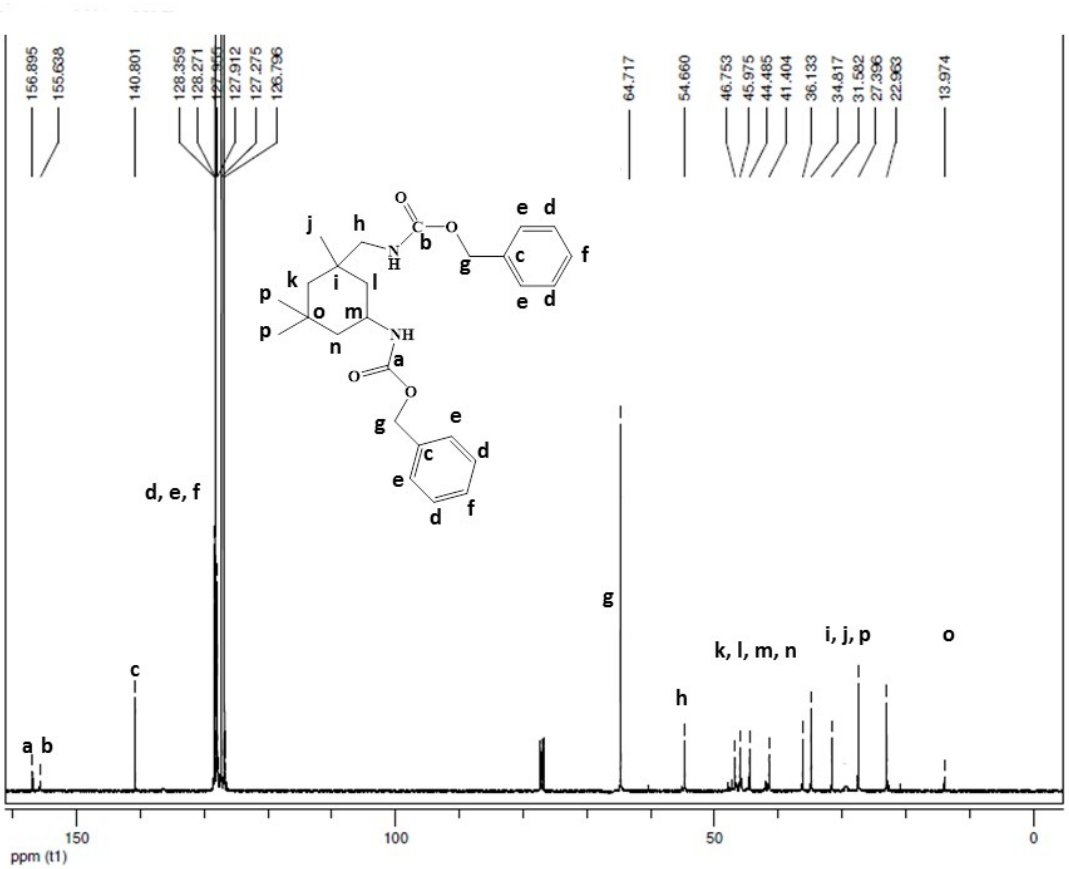


**Fig. S3** $^{13}C$ NMR spectra ($CDCl_3$, $25^0C$) of Benzyl((5-(((benzyloxy)carbonyl)amino)-1,3,3 trimethylcyclohexyl)methyl)carbamate.

## References

1. L. L. Gao, Y. H. Liu, H. Lei, H. Peng and R. Ruan, *J. Appl. Polym. Sci.*, 2010, **116**, 1694–1699.