Supporting Information for:

Stabilization of the Thermal Decomposition Process of Self-reducible Copper Ion Ink for Direct Printed Conductive Patterns

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Contents:

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5. Thermal decomposition process of CuF-IPA-OA film with different film thickness.

6. Full size picture of Figure 3 and particle size distribution with various OA/MIPA ratio.

7. Particle size distribution of CuF-MIPA-OA film at calcination temperature of 110 ˚C, 125 ˚C, and 140 ˚C.

8. Photograph of a pen-writing copper thin film.

9. Comparison of characteristics with other low temperature sinterable MOD ink related papers.

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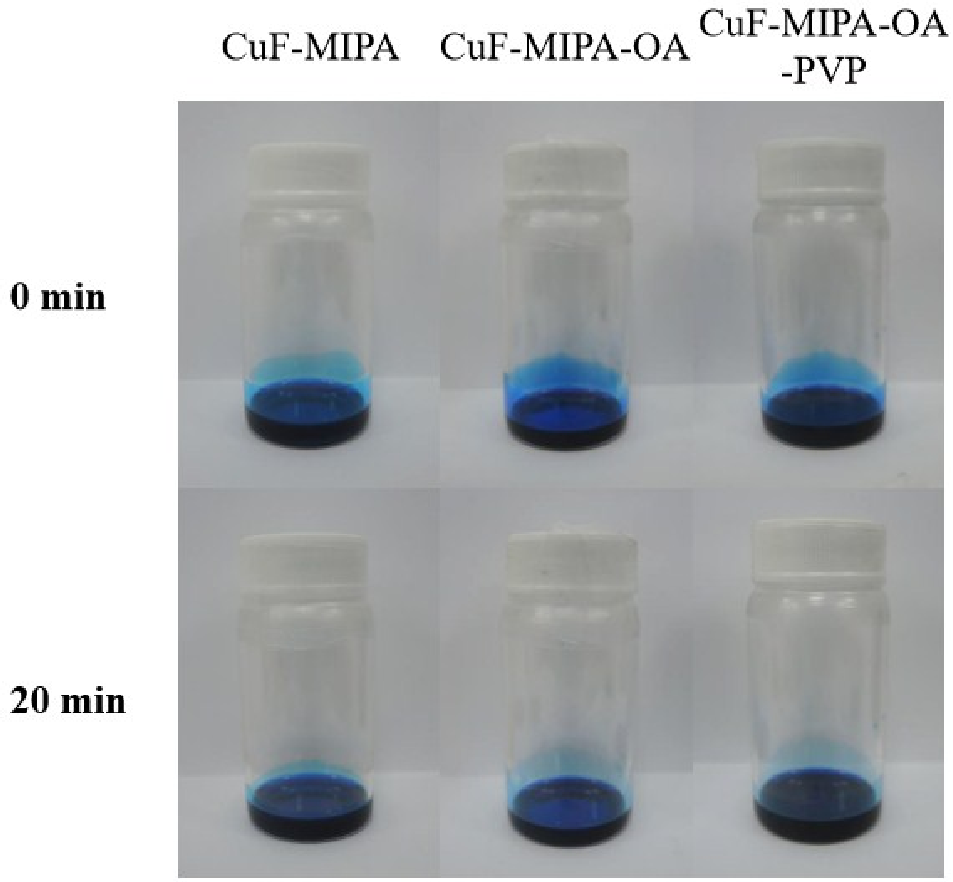
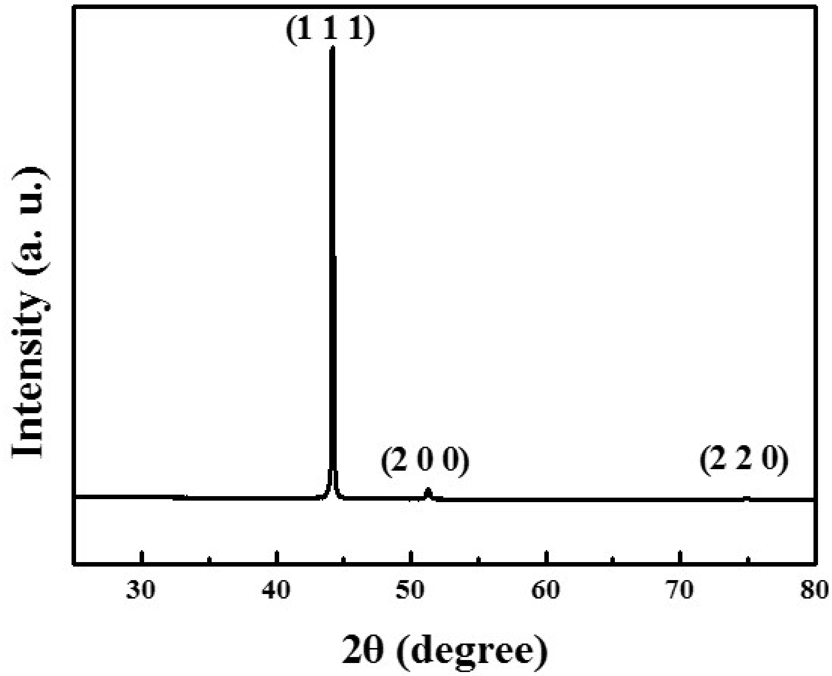


Figure S1. Photographs of CuF-MIPA, CuF-MIPA-OA and CuF-MIPA-OA ink with 1 wt% PVP (CuF-IPA-OA-PVP ink). The ink over the wall is due to the stirring effect in the preparation process and nearly disappear after 20 minutes.

(a)



(b)

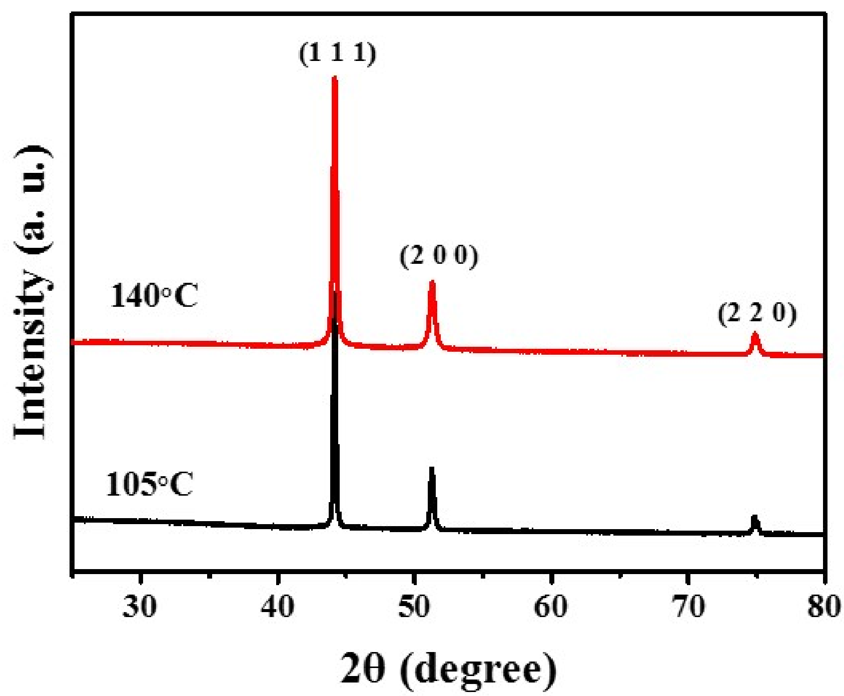


Figure S2. (a) XRD pattern of CuF-MIPA film sintered at 120 ˚C for 40 minutes under N_2 atmosphere. (b) XRD pattern of copper thin film obtained from calcination of CuF-MIPA-OA ink at 105 ˚C and 140 ˚C for 40 minutes.

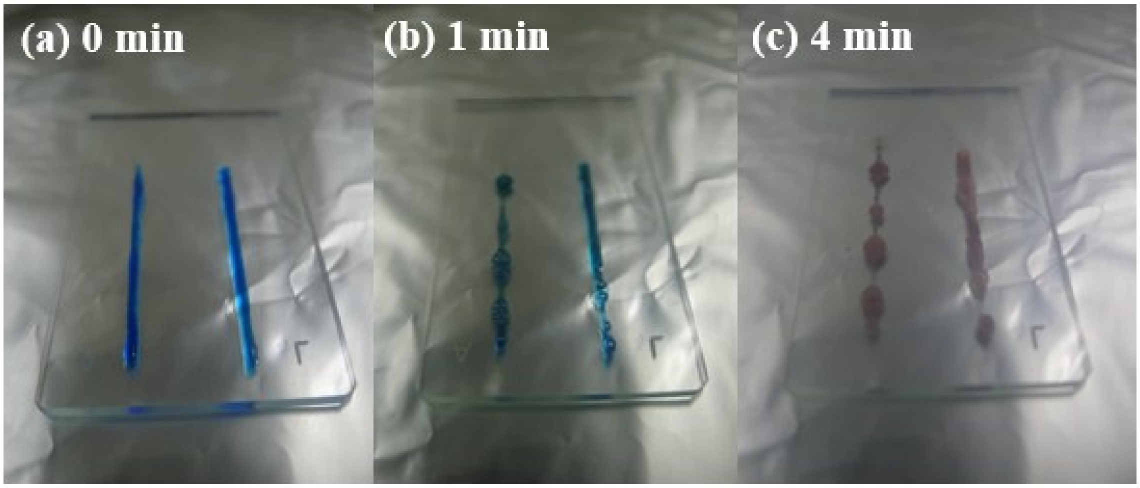
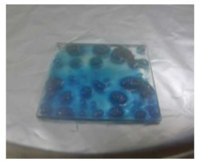
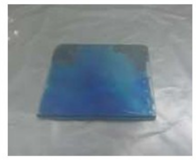
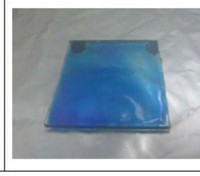
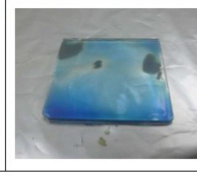
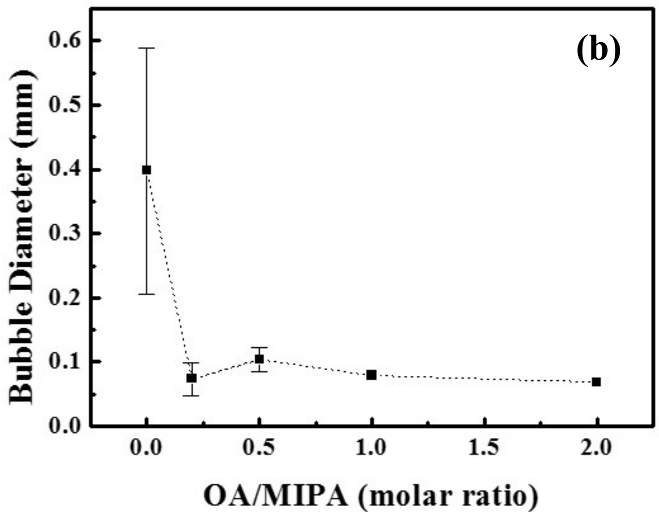


Figure S3. Photographs of printed lines using CuF-MIPA ink calcined at 140 ˚C under N_2 atmosphere.

(a)

OA/MIPA (molar ratio)	0	0.2	0.5	1	2
Photo					



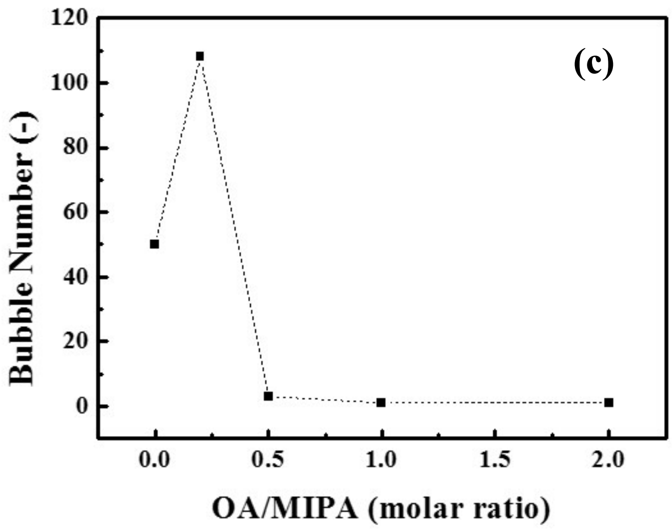


Figure S4. (a) The photography of thermal decomposition process of copper ink with different OA/MIPA ratio. The photo was taken when copper starts to nucleate. Variation of (b) bubble size and (c) number with OA/MIPA ratio.

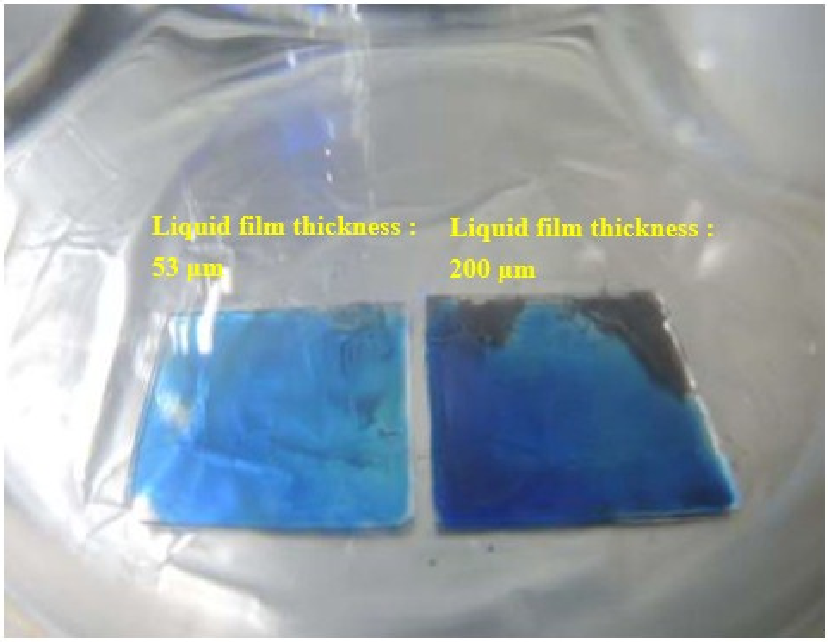


Figure S5. Thermal decomposition process of CuF-IPA-OA film with different film thickness. The photograph was taken when copper starts to nucleate.

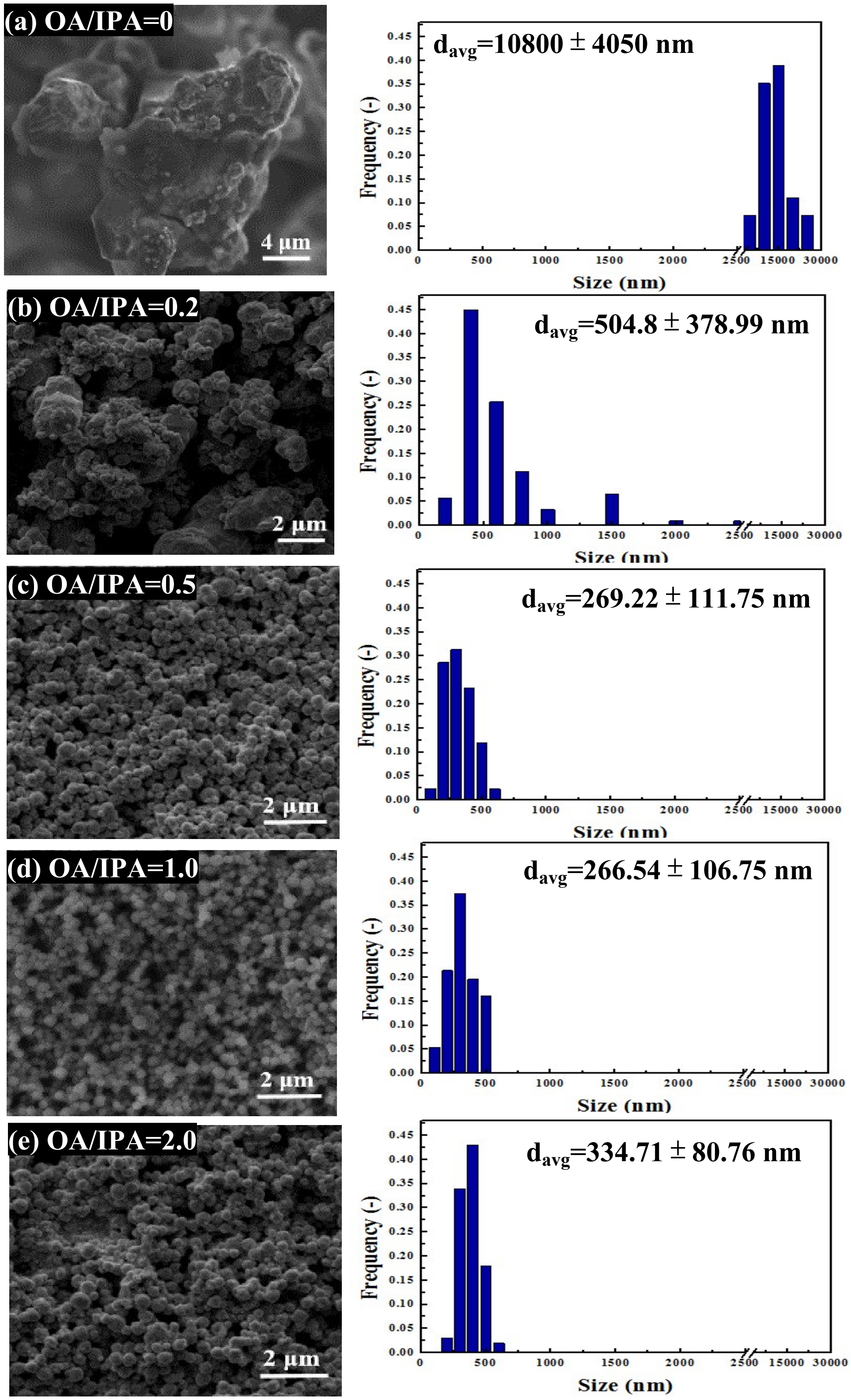


Figure S6. SEM images and particle size distributions at various OA/MIPA ratio. The particle size distributions are evaluated by image analysis from ImageJ software.

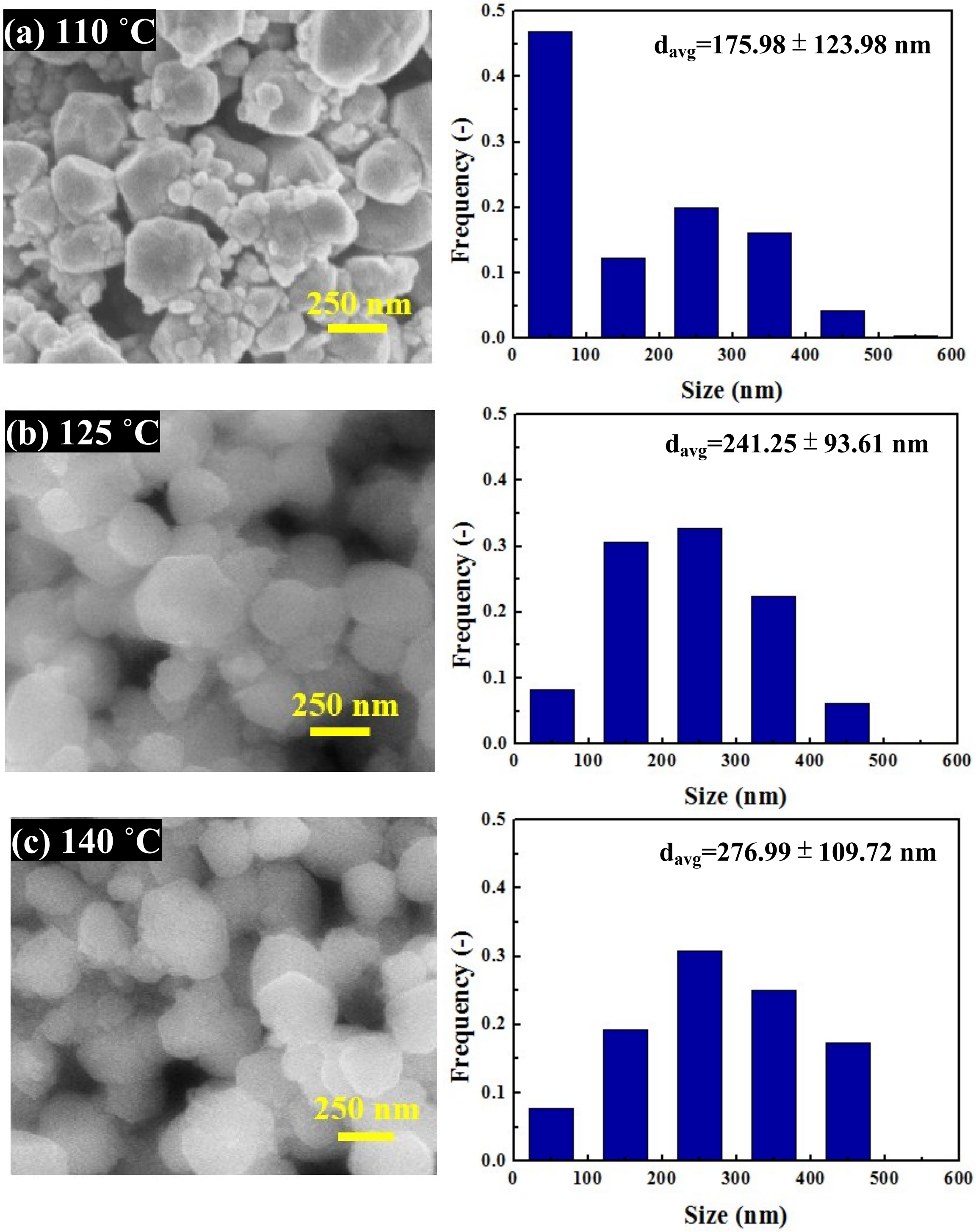


Figure S7. SEM images and particle size distributions of the CuF-MIPA-OA ink sintered at different calcination temperatures.

Figure S8. Photograph of a pen-writing copper thin film on PET. The inset picture shows the pattern before calcination.

Table S1. Comparison of characteristics with other copper MOD inks

Author	Copper complexes	Sintering condition	Sintering time	Sintering atmosphere	Resistivity (μΩ-cm)
Yabuki *et al.*, 2011 [1]	CuF + octylamine	140°C	60 min	Nitrogen	20
Yabuki *et al*, 2012 [2]	CuF+ bibutylamine + octylamine	140°C	30 min	Nitrogen	5
Farraj *et al.*, 2015 [3]	CuF+2-amino-2-methyl-1-propanol	190°C	9 min	Nitrogen	10.5
Yonezawa *et al.*, 2016 [4]	CuF+isopropanol amine+Cu particle	100°C	1 hr	Nitrogen	900
Paquet *et al.*,2016 [5]	CuF+ 3-butylpyridine + 2-ethyl-1-hexylamine	135°C	5 min	Nitrogen	14
Li *et al.*. 2016 [6]	CuF+2-amino-2-methyl-1-propanol+ Cu particle	140°C	15 min	Nitrogen	11.3
Xu *et al.*, 2016 [7]	CuF+butylamine+ octylamine	160 °C	20 min	Vacuum	21.4
Yong *et al.*, 2017 [8]	CuF+isopropanol amine+Cu particle	100°C	1 hr	Nitrogen	88
This work	CuF+ monoisopropanol amine+octylamine	140 °C	5 min	Nitrogen	20

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