

### Supplementary Information:

Specific operation method of corrosion reaming as follows:

The cutted bulk Cu-60 at. % Al alloys are placed in 1.5 M HCl solution and room temperature under free corrosion to remove Al element. When the colour of sample changed from silver white to dark red, the NPC has been obtained. Then, the NPC matrix was soaked for 12, 24, 36h by using 2.4 M HCl.

Figure 1 shows SEM micrographs of obtained NPC cross-section by etching different time. From the point of view of metal corrosion, the pore size of the NPC metal will be increased after a long time.<sup>1</sup> We also found this law through experiments.

As shown in the Fig.1a, although the fracture phenomenon is more serious due to the dealloying, pore structure of non-enlarged NPC matrix is relatively smooth, both hole wall and pore size are smaller. When the corrosion time is more than 12h, the hole wall becomes very rough. When corroding 12h, hole wall size is increased due to the increase of the hole wall fracture in corrosive liquid, as shown in Figure 1b. After etching 24h, a large number of particles which falling off the hole wall aggregated on the surface of pore wall, and pore size has a slight increase. When the samples continue to corrosion to 36h, in contrast to the previous case, the roughness of hole wall is reduced. Moreover, the pore size has increased obviously due to the continuous diffusion of agglomeration particles. According to the analysis of SEM images, the aperture is 140, 150, 160, 180nm with different etching time, respectively, as shown in the Table 1.

According to our experimental results, the mechanical properties of the NPC aperture in the 150~160nm ST NPC is relatively good, because the surface fo hole wall with middle dimension is rough, which has better plating activity in order to obtain a better coating. These analyses show that the roughness of hole wall is of great significance to obtain a good bonding interface. This point in complete agreement with our experimental results.

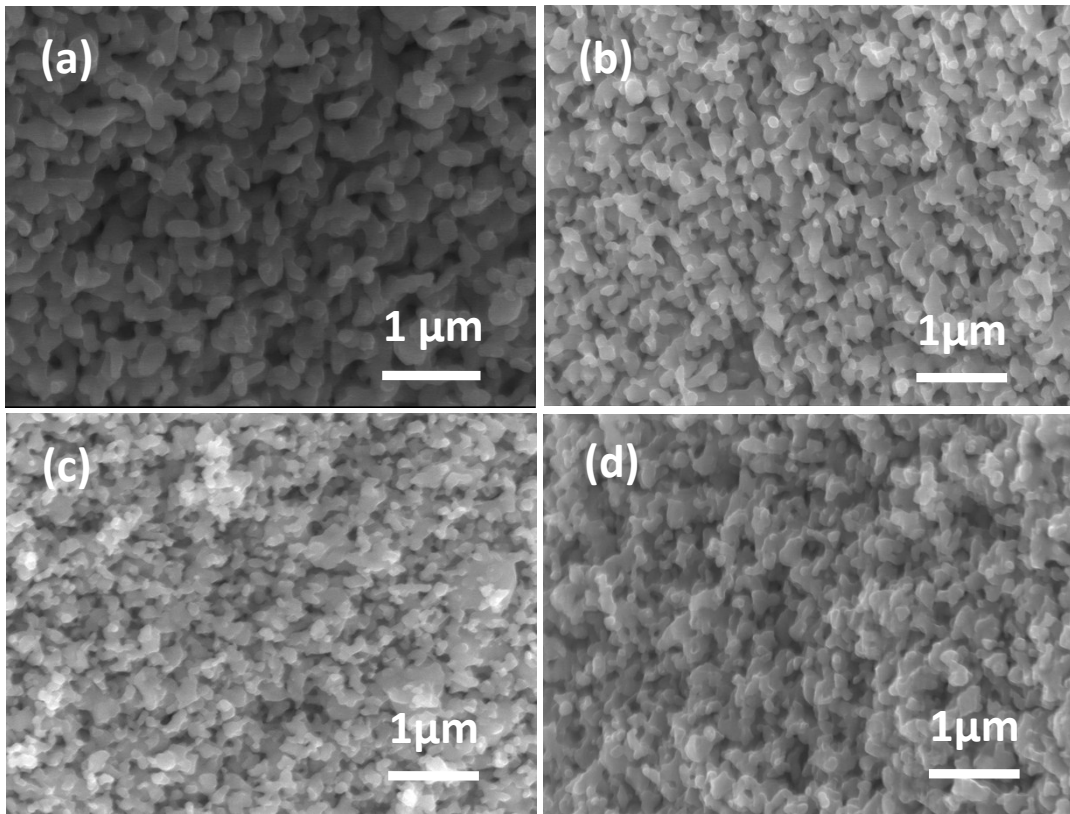


Fig. 1 SEM micrographs of obtained NPC cross-section by etching reaming after (a) 0h; (b) 12 h; (c) 24 h; (d) 36 h

Table 1 Aperture of NPC at different corrosion time

Temperature (k)	Etching time (h)	Aperture (nm)
298	0	140±10
298	12	150±10
298	24	160±10
298	36	180±10

- 1 K. Sieradzki and R. C. Newman, *Science*, 1994, **263**, 1708–1709.