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Recycling copper nanoparticles from printed circuit board waste etchants via a microemulsion process

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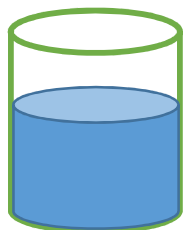
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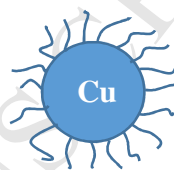
**Copper-containing
waste etchants
(CCWEs) solution**



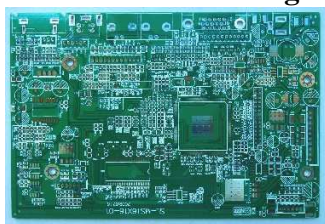
Microemulsion



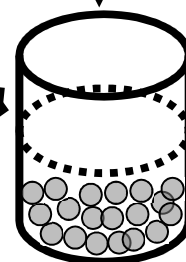
NaBH₄



PCB Manufacturing

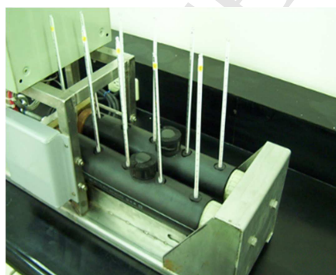


Application



Cu nanoparticles

**Heat transfer test with the
addition of Cu nanofluid**



Cu nanofluid

Graphical abstract

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