

Background & Objectives

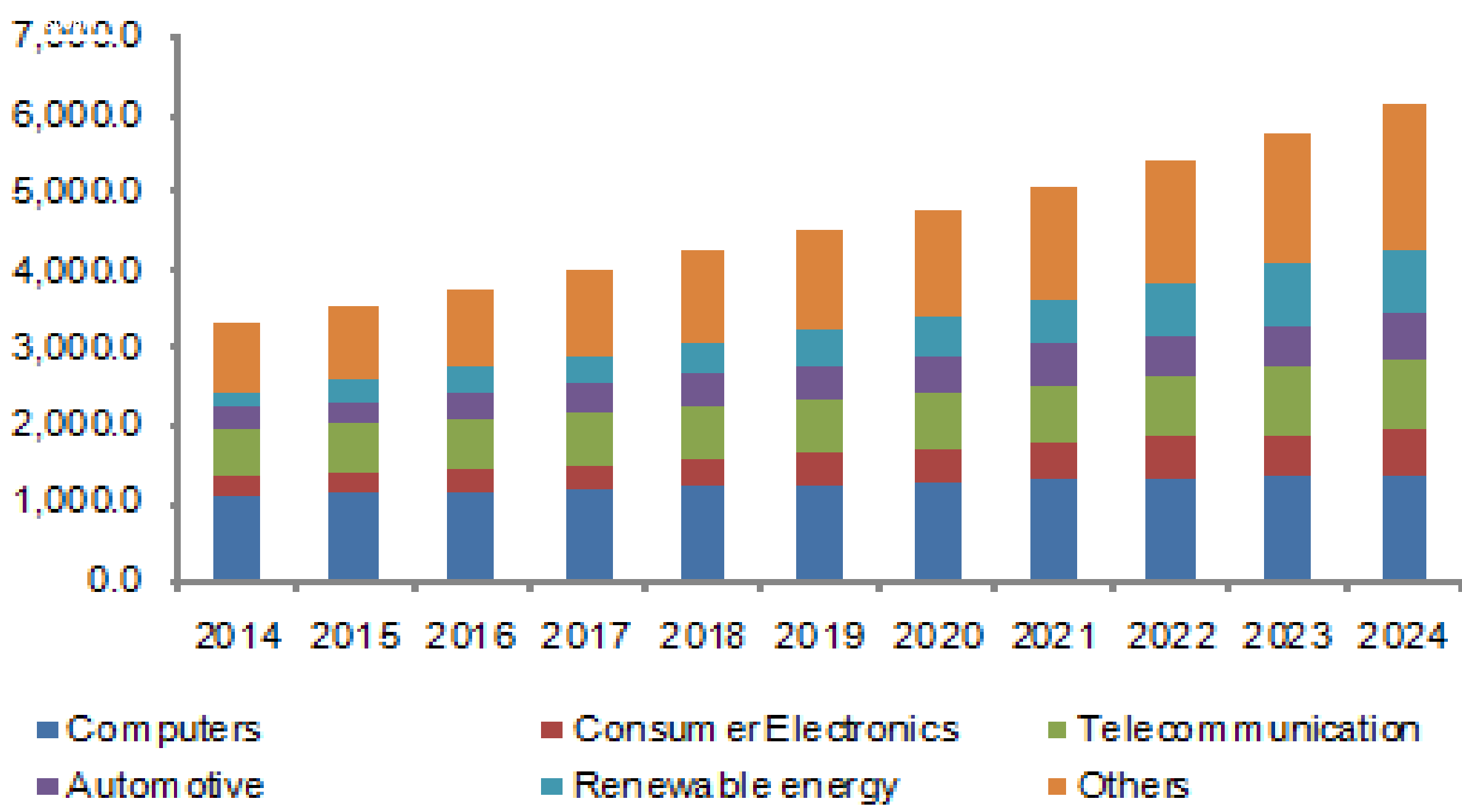


Figure 1. Thermal Management Technologies Market Demand.

- The conversion of technology from analog to digital through microchips (computers, automotive/aerospace, electronics) comes with an inevitable problem which is heat dissipation due to the operation of electronics.
- Heat anticipation problem is one of the major problems for the electronics' industry today (Figure 1).
- 2D materials (such as graphene and hBN) are the ideal candidates for this due to their excellent thermal properties.
- Our aim is to produce new composites with high thermal conductivity to dissipate heat when used in electronic devices

Methods

- **Graphene nanosheets obtained via Liquid Exfoliation method (LPE)**
Bulk graphite flakes were exfoliated via liquid exfoliation method in isopropanol (IPA) through sonic assisted LPE approach.
- **Size selection of 2D graphene nanosheets.**
- **Preparation of Graphene/ Copper composites via ultrasonication**
Mixing the copper powder with graphene dispersion in IPA via ultrasonication method through probe tip sonicator.

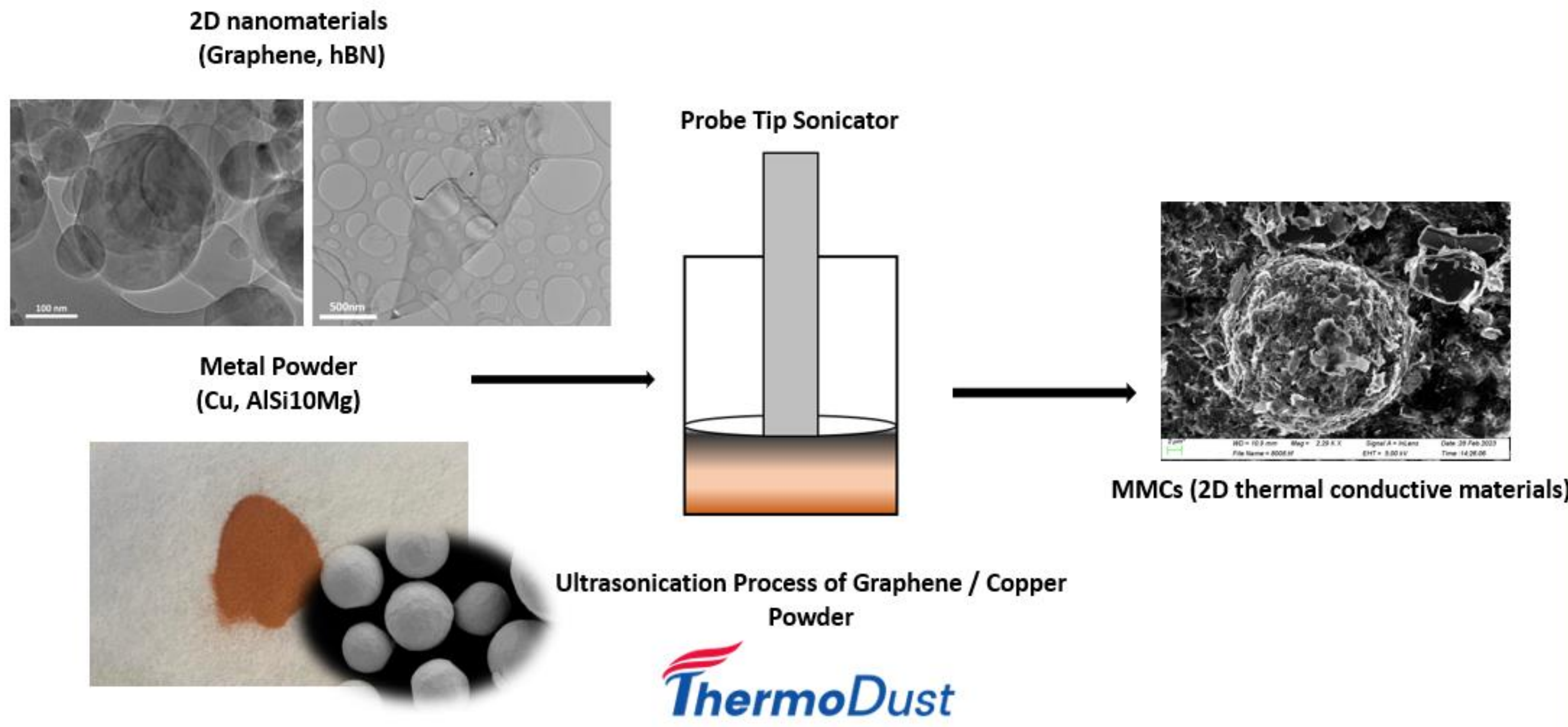


Figure 2. Schematic illustration of the processed MMCs, using ultrasonication process.

Results & Discussion

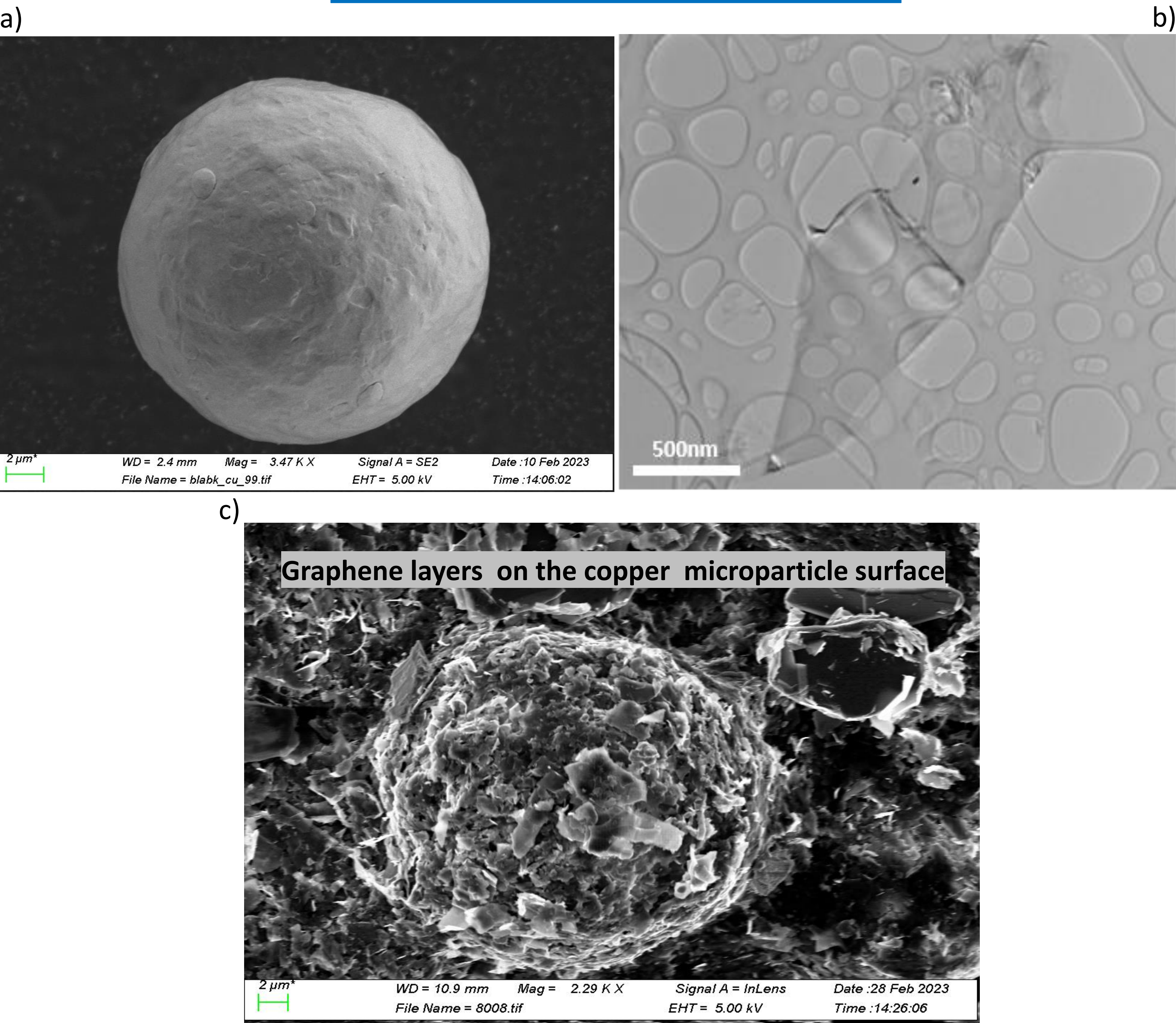


Figure 3. SEM Images of a) Pure Copper c) MMCs Cu_G and b) TEM of Graphene in IPA .

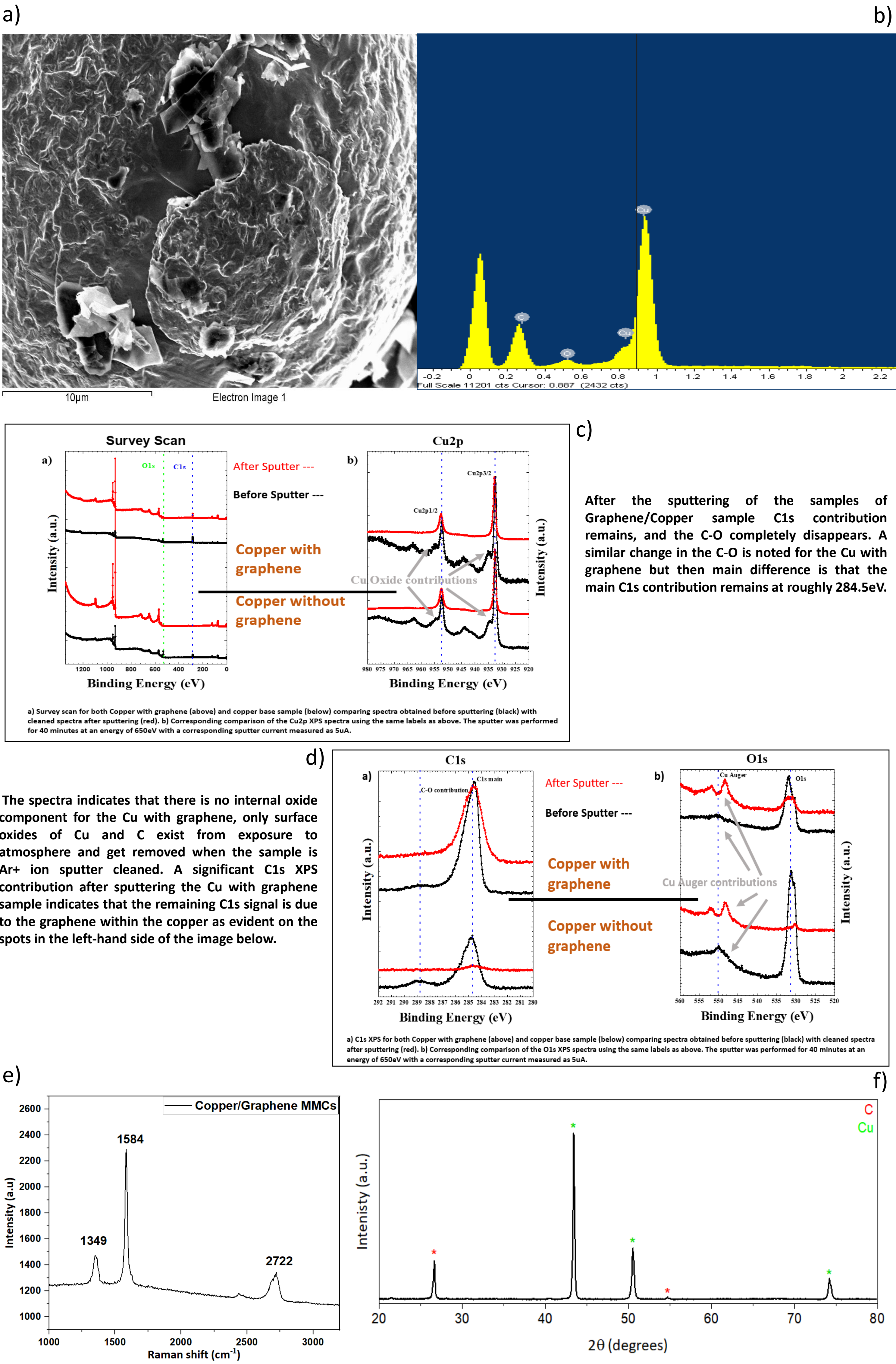


Figure 4. Images of a,b) SEM/EDX of MMCs Cu_G c) XPS spectra of pure copper and d) MMCs of Cu_G composite e) Raman spectra of MMCs f) XRD spectra of MMCs

Conclusions

- Successful preparation of Graphene/Copper composites via ultrasonication process
- Copper – Graphene seems to have good adhesion between the metal powders and 2D nanomaterials
- Ultrasonication process for the preparation MMCs seems to be a very interesting process, in terms of applicability, environmentally friendly, and low-cost method
- Additive manufacturing by using Cu/Graphene composites (powder form).