Supplementary information for:

**Effects of Cu addition on band gap energy, density of state effective mass and charge transport properties in Bi$_2$Te$_3$ composites**

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Figure S1. XPS Cu 2p$_{3/2}$ spectrum of Cu$_{0.04}$Bi$_2$Te$_3$ composite.

Although the XPS spectrum was not very sharp due to the small content of Cu in the composite, the binding energy exhibited a maximum peak around 933 eV and it was quite consistent to the reported values. In literature, the binding energy of Cu has been reported to be ~ 933 eV regardless of its oxidation state (Cu, Cu$_2$Te, CuTe).$^{S1-S3}$ Especially, Teeter reported that the binding energies for Cu$^0$, Cu$^{1+}$ and Cu$^{2+}$ were equal within about 0.05 eV.$^{S1}$ Although the identification of the oxidation state of the doped Cu was not possible due to the similarity in their binding energies, our result clearly reveals the existence of Cu-Te bonding in the Cu$_{x}$Bi$_2$Te$_3$ composite.

References

