Electronic Supplementary Information for:

Bismuth, tellurium, and bismuth telluride nanowires

Heng Yu,[a] Patrick C. Gibbons,[b] and William E. Buhro*[a]

[a]*Department of Chemistry, Washington University, St. Louis, MO 63130-4899, USA. E-mail: buhro@wuchem.wustl.edu*
[b]*Department of Physics, Washington University, St. Louis, MO 63130-4899, USA*

Table of Contents:

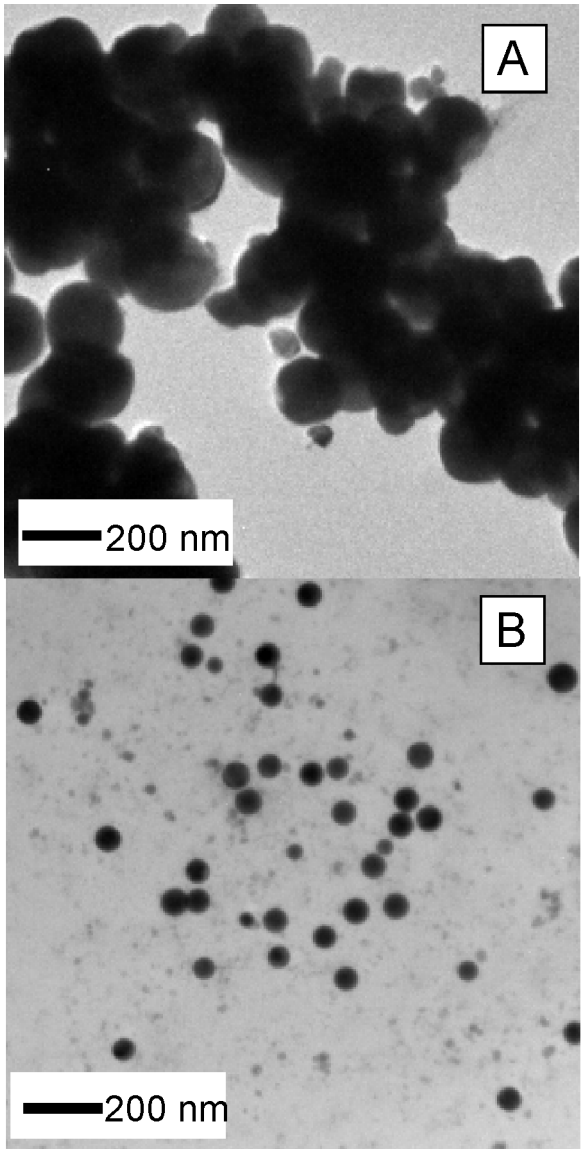

Fig. S1 (A) A TEM image of large Bi particles formed from $Bi[N(SiMe_3)_2]_3$ decomposition at 203 °C in 1,3-diisopropylbenzene. (B) A TEM image of Bi nanoparticles formed as in part A, but with poly(1-hexadecene)$_{0.67}$-*co*-(1-vinylpyrrolidinone)$_{0.33}$ added as a polymer stabilizer. These Bi nanoparticles exhibited a broad diameter distribution ranging from ca. 10-100 nm.

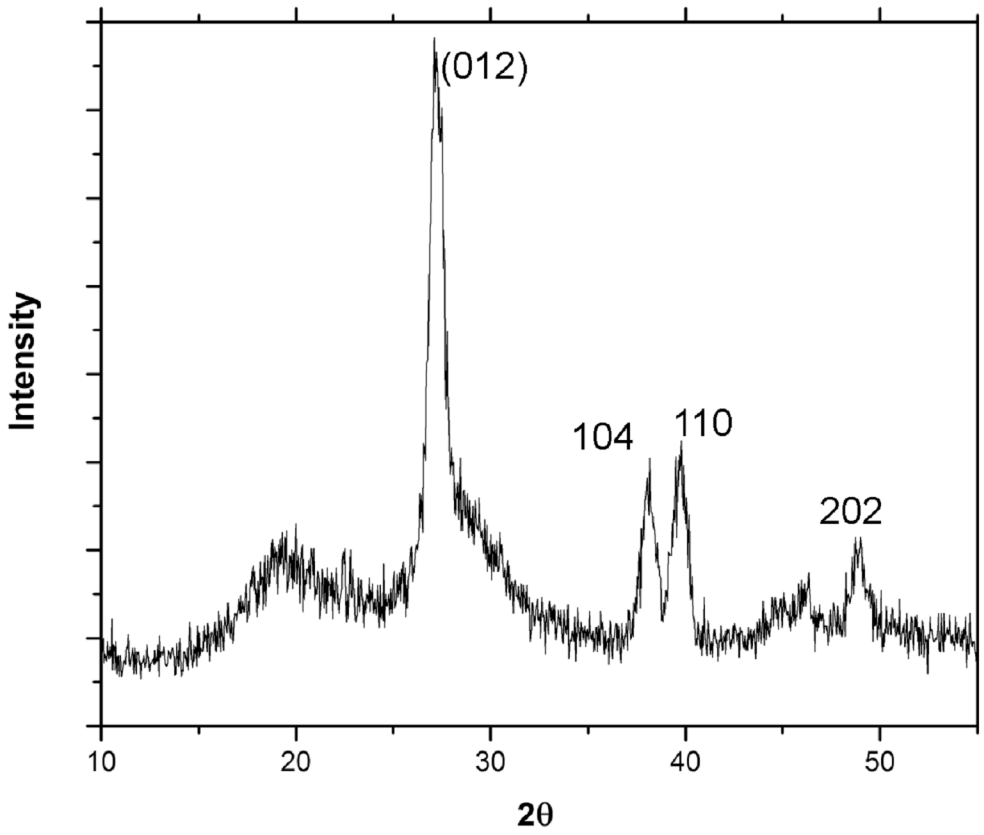

Fig. S2 An XRD pattern of Bi nanowires. The pattern is indexed to trigonal bismuth (ICDD PDF No. 44-1246). The broad peak around $2\theta = 20°$ is due to the polymer stabilizer employed. Other Bi nanoparticles having different morphologies also exhibited similar patterns.

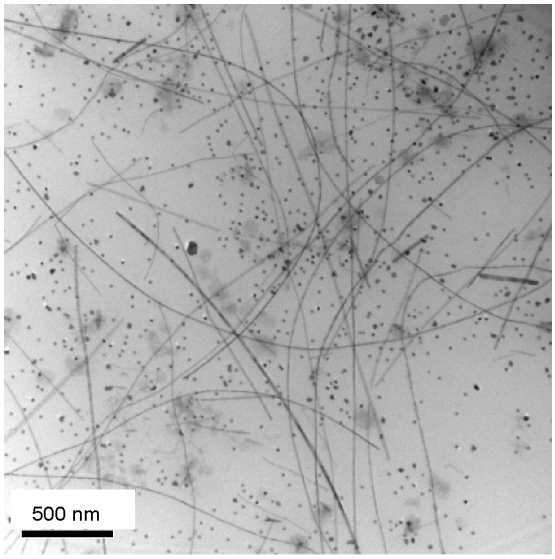

Fig. S3 A TEM image of Bi nanowires grown under the conditions used to produce the nanowires shown in Fig. 3A, but with 21.2-nm Bi nanoparticles also added at the beginning of the synthesis. The wires were generally shorter than 3 μm, and had an average diameter of 7.0 ± 2.1 nm. The coexisting dots had an average diameter of 24.4 ± 3.9 nm.

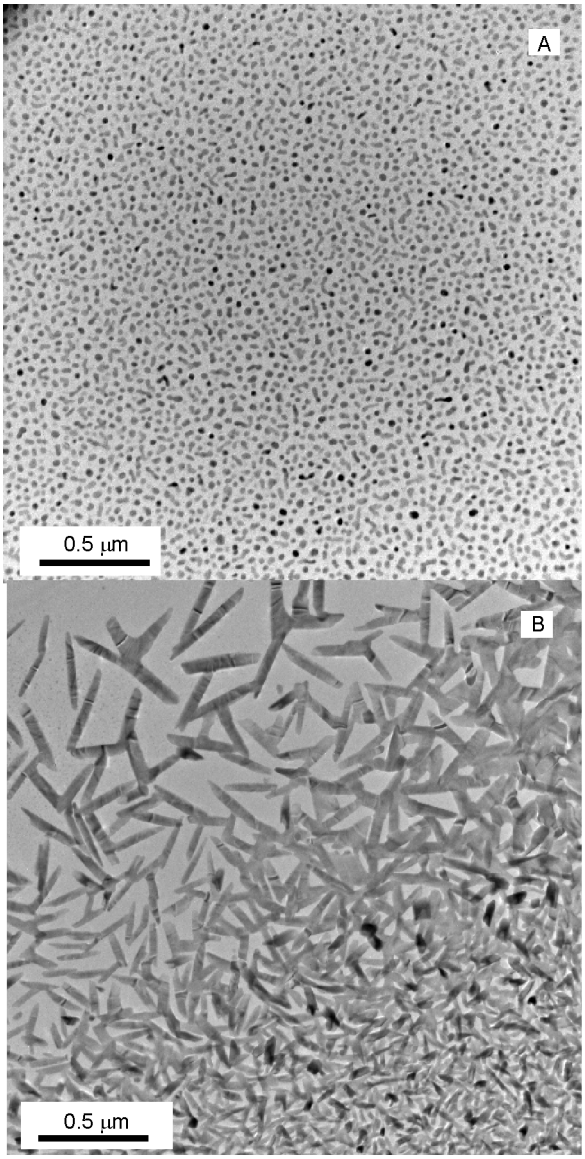

Fig. S4 TEM images of the metallic-Te precipitate produced by $TeCl_4$ decomposition in 1,3-diisopropylbenzene solvent at 203 °C, having dot (A) and rod (B) morphologies. The rods exhibited a length range of 50-600 nm. The coexisting dots had an average diameter of 20.0 ± 5.0 nm.

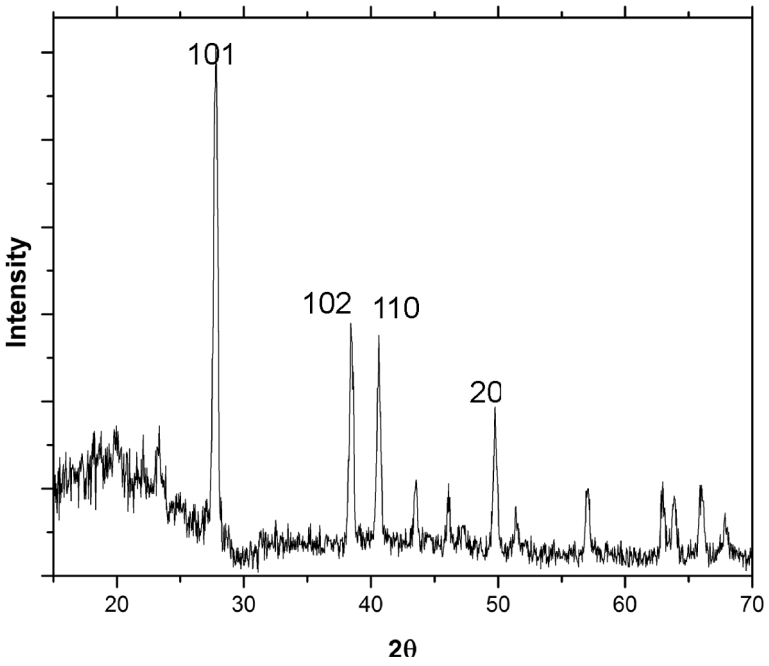

Fig. S5 An XRD pattern of Te nanowires. The pattern was indexed to the trigonal Te structure (ICDD PDF No. 36-1452). All the Te products reported here exhibited similar patterns.

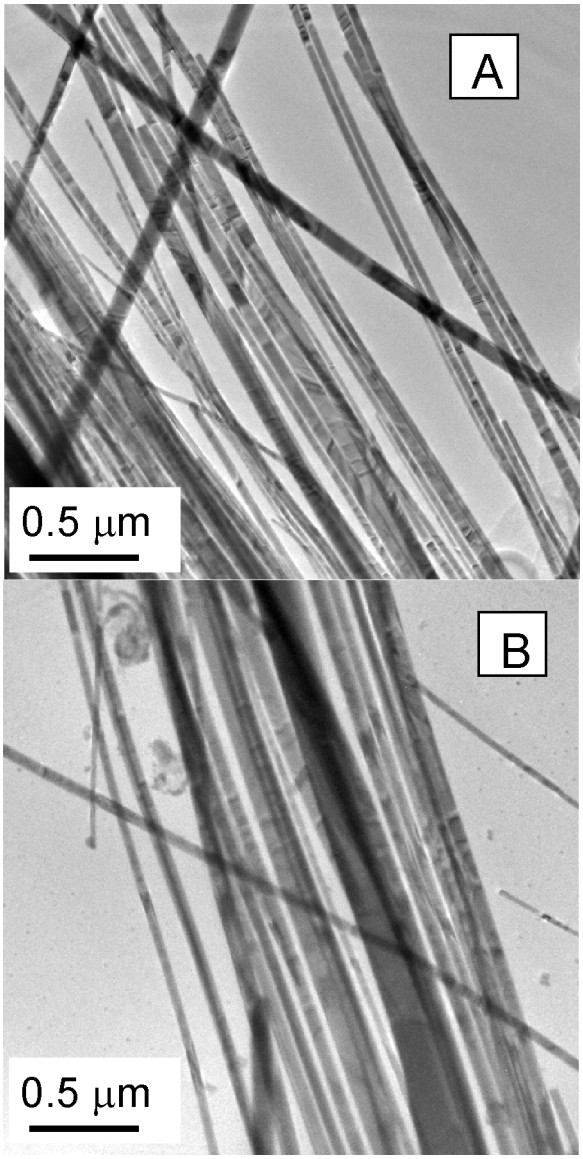

Fig. S6 (A) TEM images of Te wires formed by $TeCl_4$ decomposition in polydecene containing poly(1-hexadecene)$_{0.67}$-*co*-(1-vinylpyrrolidinone)$_{0.33}$ at 300 °C. The wires had an average diameter of 68.7 ± 20 nm. (B) TEM images of Te wires formed by $TeCl_4$ decomposition in polydecene containing ethylene glycol at 300 °C. The wires had an average diameter of 85.8 ± 43.1 nm.

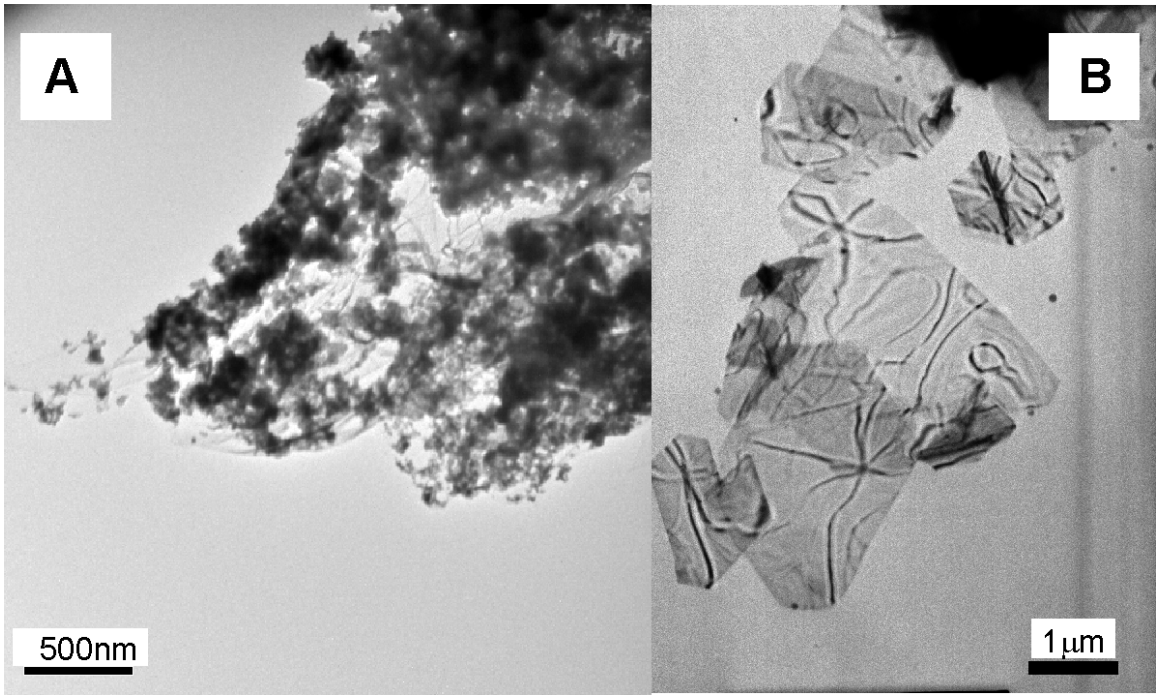

Fig. S7 (A) A TEM image of aggregated Bi_2Te_3 nanoparticles formed by reaction of $BiPh_3$ and $TeCl_4$ at 300 °C. (B) A TEM image of Bi_2Te_3 plates obtained from the reaction of $BiPh_3$ and $(octyl)_3PTe$ in 1,3-diisopropylbenzene at 180 °C.

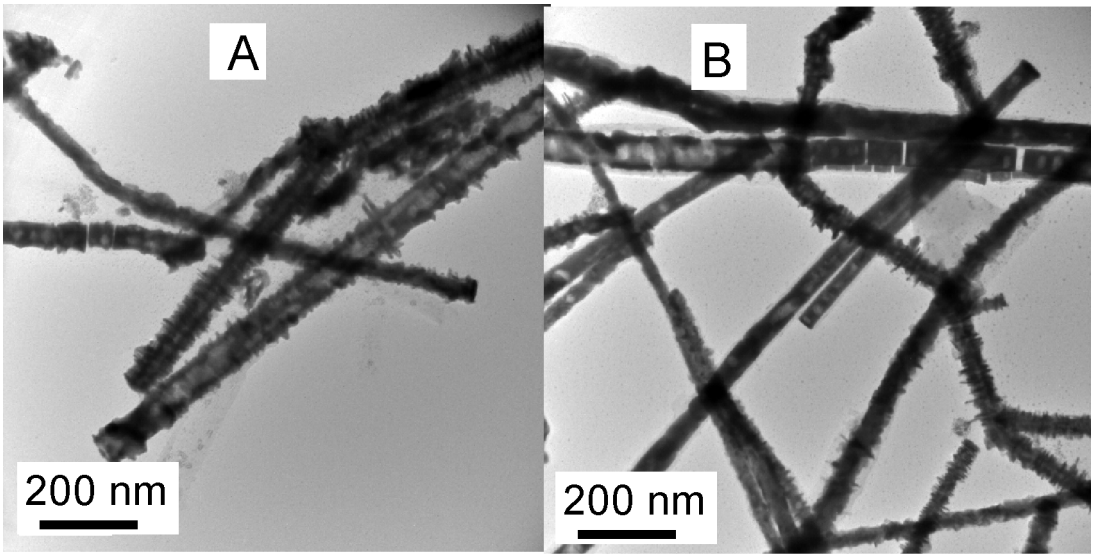

Fig. S8 TEM images of Bi_2Te_3 wires synthesized by reaction of $Bi[N(SiMe_3)_2]_3$ and Te wires in polydecenene at 200 °C. The wires were polycrystalline and some appeared to be tubular.

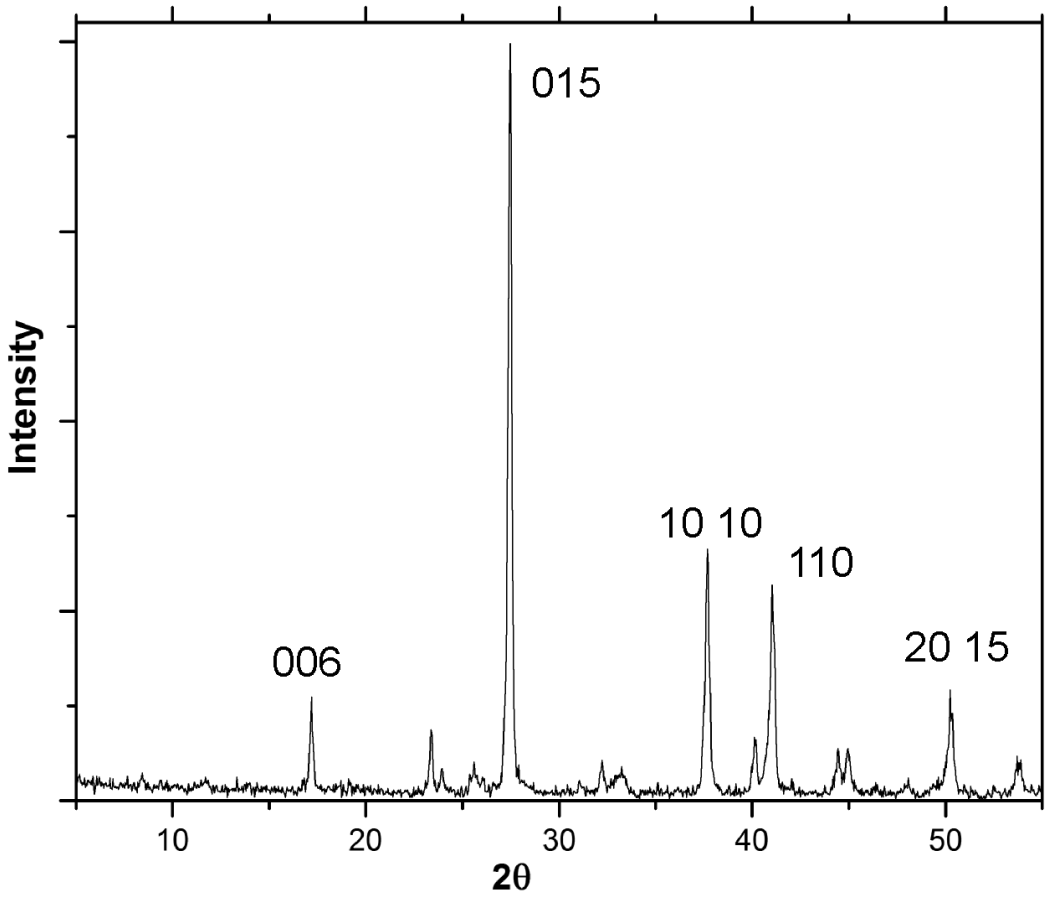

Fig. S9 An XRD pattern of the Bi_2Te_3 wires shown in Fig. 5. The pattern was indexed to the rhombohedral crystal structure of Bi_2Te_3 (ICDD PDF No. 15-0863).