

Solid state reaction is usually carried out at high temperature, which requires high energy input and consume significant amount of energy. For wet chemical synthesis, Ag_2Te has been synthesized in deionized water using 3-mercaptopropionic acid (MPA), AgNO_3 , TeO_2 , KOH , and KBH_4 at room temperature.⁶ Solvothermal synthesis has been also used to synthesize Ag_2Te nanowires at 240°C using AgNO_3 , Na_2TeO_3 , disodium salt of ethylenediaminetetraacetic acid ($\text{Na}_2(\text{EDTA})\cdot 2\text{H}_2\text{O}$), and ethylene glycol (EG).⁷ In addition, hydrothermal process has been adopted to synthesize straight single crystal Ag_2Te nanowires at 160°C using AgNO_3 , Na_2TeO_3 , N_2H_4 , and ammonia in one report,⁸ and fabricate axial-junction composite nanowires of Ag_2Te -Ag using Ag_2TeO_3 , glucose and NaOH at 165°C in another report.⁵ The precursor Ag_2TeO_3 in ref. 15 is obtained by mixing aqueous AgNO_3 and Na_2TeO_3 solution. The reagent of the reported wet chemical reaction always involves AgNO_3 , which is very soluble in water (256 g/100 ml at 25°C). In addition, some organic material is often added in the reported synthesis.

Table S1. Comparison of relative integrated reflection intensity ratio of (-2 1 2) for Ag_2Te and (1 1 1) for Ag among Ag_2Te -Ag composites synthesized for 1-3 day.

Reaction Duration	Integrated Intensity of (220) for Ag_2Te	Integrated Intensity of (111) for Ag	Ratio of (111)/(220)
1 day	2510	1134	0.45
2 days	4092	886	0.22
3 days	2859	362	0.13