WHAT IS CLAIMED IS:

1. A method of making a chalcogen-containing photoabsorbing composition, comprising the steps of:

(a) sputtering metals comprising Cu and Ga using at least one first sputtering target in the presence of (i) one or more second targets containing a chalcogen, or (ii) a chalcogen-containing gas or vapor ~~chalcogens~~ to form a precursor of the chalcogen-containing ~~photoabsorber~~photoabsorbing composition, wherein the precursor includes a sub-stoichiometric amount of at least one chalcogen, wherein the at least one ~~or more~~ chalcogen~~s are~~ is selected from Se and/or S; and

(b) subjecting the precursor to a chalcogenization treatment in the presence of Se and optionally S to convert the precursor into a chalcogenide photoabsorbing material.

2. The method of claim 1, wherein step (a) comprises co-sputtering the metals and the chalcogens using at least one sputtering target that has a substoichiometric chalcogen content and the chalcogens during co-sputtering do not include Te.

3. The method of any preceding claim, wherein the precursor is at least partially amorphous.

4. The method of any preceding claim, wherein step (a) comprises selectively incorporating at least one chalcogen into one or more portions of the precursor, wherein the at least one chalcogen is selectively incorporated into at least one boundary region of the precursor, and wherein Ga and at least one chalcogen are selectively co-incorporated into one or more portions of the precursor.

5. The method of any preceding claim, wherein step (a) comprises sputtering at least one chalcogen-containing target to form at least a portion of the precursor and/or wherein step (a) comprises sputtering at least one target in the presence of a chalcogen containing gas or vapor.

6. The method of any preceding claim, wherein the precursor comprises at least two metals selected from Cu, In, and Ga, and the atomic ratio of chalcogen to the cumulative amount of metals in the precursor is in the range from 0.01 to 0.8.

7. The method of any preceding claim, wherein step (a) comprises forming a precursor comprising a plurality of layers and at least one chalcogen is incorporated into some, but not all the layers of the precursor and wherein Ga is co-incorporated into at least one layer of the precursor that includes at least one chalcogen and is not included in at least one other layer of the precursor.