

- [54] **METHOD FOR OPTIMIZING PHOTORESPONSIVE AMORPHOUS ALLOYS AND DEVICES**
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- [*] Notice: The portion of the term of this patent subsequent to Jul. 27, 1999 has been disclaimed.
- [21] Appl. No.: 368,221
- [22] Filed: Apr. 14, 1982

Related U.S. Application Data

- [60] Division of Ser. No. 185,520, Sep. 9, 1980, Pat. No. 4,342,044, which is a continuation-in-part of Ser. No. 884,664, Mar. 8, 1978, Pat. No. 4,217,374, and a continuation-in-part of Ser. No. 104,285, Dec. 17, 1979, abandoned, which is a division of Ser. No. 884,664.
- [51] Int. Cl.³ C22C 28/00; H01L 31/18
- [52] U.S. Cl. 148/403; 136/258; 148/174; 357/2; 357/30; 427/39; 427/74; 427/86; 420/578; 420/903; 204/192 S; 430/86
- [58] Field of Search 427/39, 74, 86; 204/192 S, 192 P; 148/174, 403; 136/258 AM; 75/134 G; 357/134 S, 2; 420/556, 578, 903

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[57] ABSTRACT

The production of improved photoresponsive amorphous alloys and devices, such as photovoltaic, photo-receptive devices and the like; having improved wavelength threshold characteristics is made possible by adding one or more band gap adjusting elements to the alloys and devices. The adjusting element or elements are added at least to the active photoresponsive regions of amorphous devices containing silicone and fluorine, and preferably hydrogen. One adjusting element is germanium which narrows the band gap from that of the materials without the adjusting element incorporated therein. Other adjusting elements can be used such as tin. The silicon and adjusting elements are concurrently combined and deposited as amorphous alloys by vapor deposition, sputtering or glow discharge decomposition. The addition of fluorine bonding and electronegativity to the alloy acts as a compensating or altering element to reduce the density of states in the energy gap thereof. The fluorine bond strength allows the adjusting element(s) to be added to the alloy to adjust the band gap without reducing the electronic qualities of the alloy. Hydrogen also acts as a compensating or altering element to compliment fluorine when utilized therewith. The compensating or altering element(s) can be added during deposition of the alloy or following deposition. The addition of the adjusting element(s) to the alloys adjusts the band gap to a selected optimum wavelength threshold for a particular device to increase the photoabsorption efficiency to enhance the device photoresponsive without adding states in the gap which decrease the efficiency of the devices. The adjusting element(s) can be added in varying amounts, in discrete layers or in substantially constant amounts in the alloys and devices.

25 Claims, 13 Drawing Figures

