



US005129360A

# United States Patent [19]

[11] Patent Number: **5,129,360**

Ahern et al.

[45] Date of Patent: **Jul. 14, 1992**

[54] **ACTIVELY COOLED EFFUSION CELL FOR CHEMICAL VAPOR DEPOSITION**

4,747,368 5/1988 Brien ..... 118/724  
4,920,918 5/1990 Adams ..... 118/725  
5,000,113 3/1991 Wang ..... 118/723

[75] Inventors: **Brian S. Ahern, Boxboro; David W. Weyburne, Maynard, both of Mass.**

### FOREIGN PATENT DOCUMENTS

[73] Assignee: **The United States of America as represented by the Secretary of the Air Force, Washington, D.C.**

60-178621 9/1985 Japan ..... 118/726  
60-202937 10/1985 Japan .

[21] Appl. No.: **469,128**

*Primary Examiner*—Richard Bueker  
*Attorney, Agent, or Firm*—Stanton E. Collier; Donald J. Singer

[22] Filed: **Jan. 24, 1990**

### [57] ABSTRACT

[51] Int. Cl.<sup>5</sup> ..... **C23C 16/00**

[52] U.S. Cl. .... **118/724; 118/715; 118/725**

[58] Field of Search ..... **118/715, 724, 725**

### [56] References Cited

#### U.S. PATENT DOCUMENTS

3,098,763	7/1963	Deal	118/724
3,850,679	11/1974	Sopko	118/725
4,051,382	9/1977	Ogawa	204/164
4,512,391	4/1985	Harra	165/48 R
4,615,294	10/1986	Scrapple	118/725
4,625,678	12/1986	Shioya	118/724
4,664,743	5/1987	Moss et al.	156/613
4,693,211	9/1987	Ogami et al.	118/725
4,722,911	2/1988	Frijlink	437/110
4,736,705	4/1988	Weyburne	118/725
4,745,088	5/1988	Inoue	118/724

An actively cooled effuser for a vapor deposition reactor is placed in very close proximity to a substrate. The actively cooled effuser has combinations of gas directing plates, cooling plates and isolation plates attached together. Reactants and coolant are input into the stack of plates so formed. Selective heating of the substrate surface may occur through the use of heating lamps. Multiple units of the actively cooled effuser and heating lamps may be used in the reactor to form multiple layers on the substrate. The cooling plate has a cooling channel within a few thousandths of an inch of the output side of the stack. The presence of the cooling plate allows the effuser to be placed in very close proximity to the selectively heated substrate.

7 Claims, 2 Drawing Sheets

