



US005219485A

United States Patent [19]

[11] Patent Number: **5,219,485**

Wang et al.

[45] Date of Patent: **Jun. 15, 1993**

[54] **MATERIALS AND METHODS FOR ETCHING SILICIDES, POLYCRYSTALLINE SILICON AND POLYCIDES**

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[73] Assignee: **Applied Materials, Inc.**, Santa Clara, Calif.

[21] Appl. No.: **778,326**

[22] Filed: **Oct. 17, 1991**

Related U.S. Application Data

[60] Division of Ser. No. 443,811, Nov. 29, 1989, Pat. No. 5,112,435, which is a continuation of Ser. No. 185,256, Apr. 19, 1988, abandoned, which is a continuation of Ser. No. 786,783, Oct. 11, 1985, abandoned.

[51] Int. Cl.⁵ **H01L 21/302**

[52] U.S. Cl. **252/79.3; 156/643; 156/646; 156/656; 156/657; 156/662**

[58] Field of Search **156/643, 646, 656, 657, 156/662; 252/79.3**

[56] References Cited

U.S. PATENT DOCUMENTS

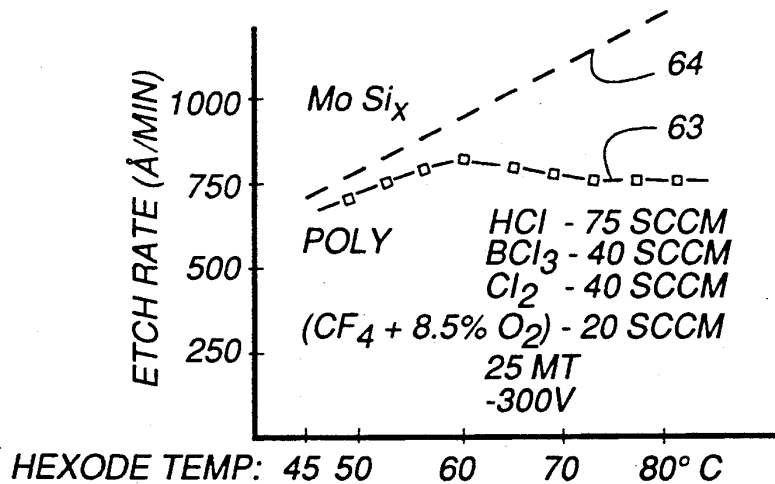
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Primary Examiner—Thi Dang
Attorney, Agent, or Firm—Philip A. Dalton

[57] ABSTRACT

Gas chemistry and a related RIE mode process is described for etching silicides of the refractory metals titanium, tantalum, tungsten and aluminum and for etching composites of these silicides on polycrystalline silicon layers. BCl₃ is added to the HCl/Cl₂ gas chemistry used for the polysilicon etch along with additives selected from fluorinated gases and oxygen to satisfy the multiple requirement of the two-step silicide-polysilicon etch process, including the silicide-to-polysilicon etch ratio requirement.

9 Claims, 11 Drawing Sheets



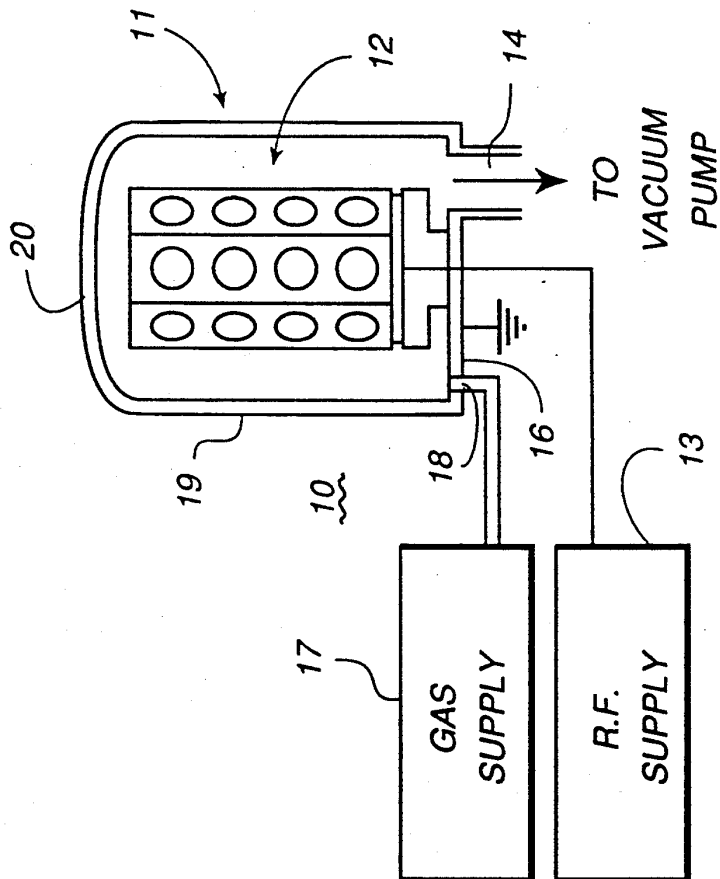


Figure 1

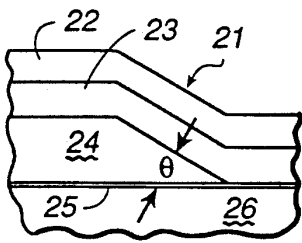


Figure 2

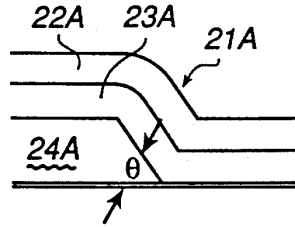


Figure 2A

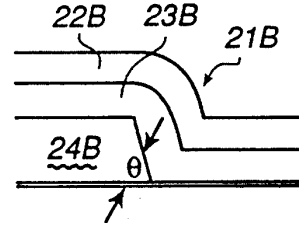


Figure 2B

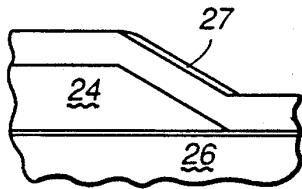


Figure 3

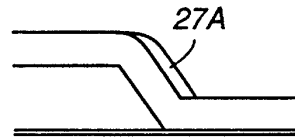


Figure 3A

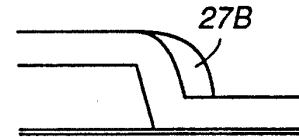


Figure 3B

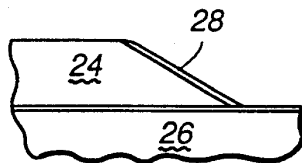


Figure 4

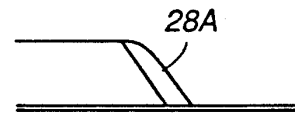


Figure 4A

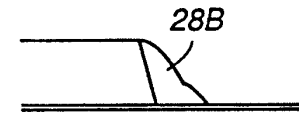


Figure 4B

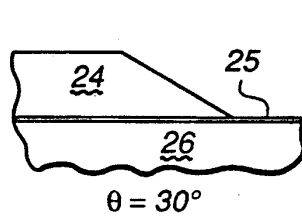


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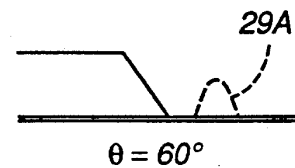


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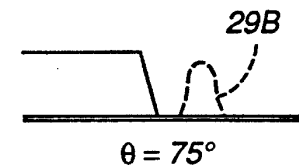


Figure 5B

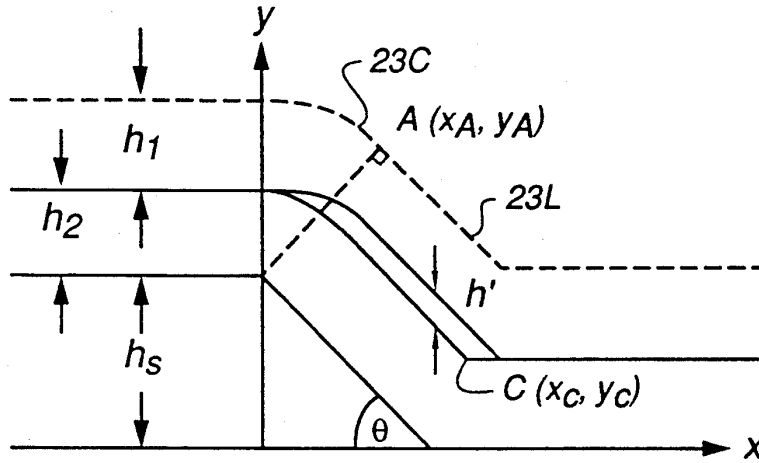


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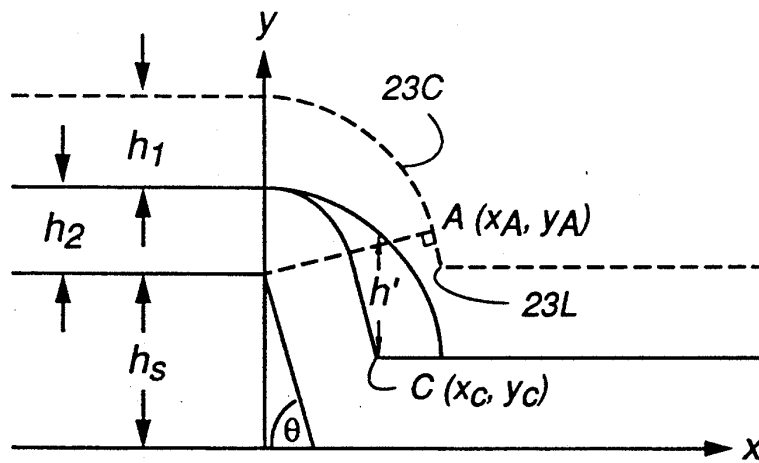


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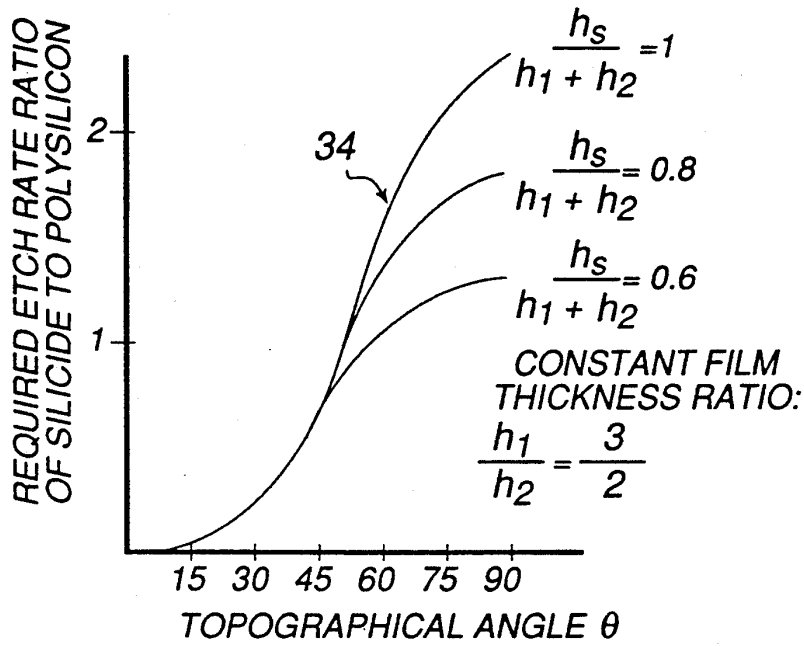


Figure 8

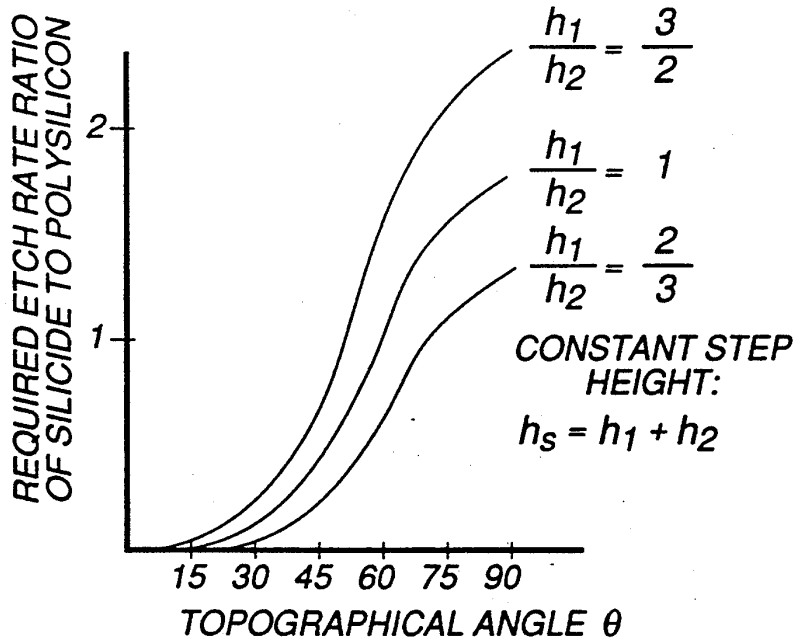


Figure 9

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