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(12) **United States Patent**
Basceri

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(54) **METHOD OF FORMING CONDUCTIVE METAL SILICIDES BY REACTION OF METAL WITH SILICON**

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Related U.S. Application Data

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(57) **ABSTRACT**

(51) **Int. Cl.**

H01L 21/44 (2006.01)

(52) **U.S. Cl.** **438/682**; 438/683; 438/685; 438/686; 438/649; 438/651; 257/E21.507; 257/E21.576; 257/E21.584; 257/E21.59

(58) **Field of Classification Search** 438/682, 438/683, 685, 686, 648, 651, 656
See application file for complete search history.

The invention includes methods of forming conductive metal silicides by reaction of metal with silicon. In one implementation, such a method includes providing a semiconductor substrate comprising an exposed elemental silicon containing surface. At least one of a nitride, boride, carbide, or oxide comprising layer is atomic layer deposited onto the exposed elemental silicon containing surface to a thickness no greater than 15 Angstroms. Such layer is exposed to plasma and a conductive reaction layer including at least one of an elemental metal or metal rich silicide is deposited onto the plasma exposed layer. Metal of the conductive reaction layer is reacted with elemental silicon of the substrate effective to form a conductive metal silicide comprising contact region electrically connecting the conductive reaction layer with the substrate. Other aspects and implementations are contemplated.

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48 Claims, 2 Drawing Sheets

