US007135361B2

(12) **United States Patent**
Visokay et al.

(10) **Patent No.: US 7,135,361 B2**

(45) **Date of Patent: Nov. 14, 2006**

(54) **METHOD FOR FABRICATING TRANSISTOR GATE STRUCTURES AND GATE DIELECTRICS THEREOF**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 49 days.

(21) Appl. No.: **10/734,708**

(22) Filed: **Dec. 11, 2003**

(65) **Prior Publication Data**

US 2005/0130442 A1 Jun. 16, 2005

(51) **Int. Cl.**
H01L 21/336 (2006.01)

(52) **U.S. Cl.** **438/197**; 438/199; 438/785

(58) **Field of Classification Search** 438/3, 438/197, 199, 216, 287, 591, 778, 785
See application file for complete search history.

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(57) **ABSTRACT**

Methods are disclosed for treating deposited gate dielectric materials, in which the deposited dielectric is subjected to one or more non-oxidizing anneals to densify the material, one or more oxidizing anneals to mitigate material defects, and to a nitridation process to introduce nitrogen into the gate dielectric. The annealing may be performed before and/or after the nitridation to mitigate deposition and/or nitridation defects and to densify the material while mitigating formation of unwanted low dielectric constant oxides at the interface between the gate dielectric and the semiconductor substrate.

40 Claims, 5 Drawing Sheets