Erratum: "Porosity as a function of stoichiometry and implantation temperature in Ge/$Si_{1-x}Ge_x$ alloys" [J. Appl. Phys. 119, 094303 (2016)]

H. S. Alkhaldi, F. Kremer, T. Bierschenk, J. L. Hansen, A. Nylandsted-Larsen, J. S. Williams, and M. C. Ridgway

Citation: Journal of Applied Physics **121**, 049902 (2017); doi: 10.1063/1.4975029
View online: https://doi.org/10.1063/1.4975029
View Table of Contents: http://aip.scitation.org/toc/jap/121/4
Published by the American Institute of Physics

Erratum: "Porosity as a function of stoichiometry and implantation temperature in Ge/$Si_{1-x}Ge_x$ alloys" [J. Appl. Phys. 119, 094303 (2016)]

H. S. Alkhaldi,[1,2] F. Kremer,[3] T. Bierschenk,[1] J. L. Hansen,[4] A. Nylandsted-Larsen,[4] J. S. Williams,[1] and M. C. Ridgway[1]

[1]*Department of Electronic Materials Engineering, Australian National University, Canberra ACT 2601, Australia*
[2]*Department of Physics in Jubail Education college, Dammam University, Dammam 1982, Saudi Arabia*
[3]*Centre for Advanced Microscopy, Australian National University, Canberra ACT 2601, Australia*
[4]*Department of Physics and Astronomy, Aarhus University, DK-8000 Aarhus C, Denmark*

(Received 13 December 2016; accepted 17 January 2017; published online 24 January 2017)

[http://dx.doi.org/10.1063/1.4975029]

We would like to correct the following errors in the original paper:[1]

1. Figs. 5 and 6 have been replaced with the new figures due to labelling errors in the original figures. In Fig. 6 caption, replace "Volumetric swelling" with "Step height." Fig. 5 caption stays the same.
2. Replace the first sentence on page 4, right column, and paragraph 3 with: "Fig. 5 shows the step height as a function of ion fluence for various alloy stoichiometries."
3. Replace the paragraph 4 on page 4, right column, with: "The $Si_{0.17}Ge_{0.83}$ alloy shows somewhat different behavior to Ge, although three distinct regimes are also present. The step heights are smaller compared to Ge in stage II, and sputtering is dominant at high fluences $\geq 2 \times 10^{17}$ ions/cm^2 in stage III. In the case of $Si_{0.23}Ge_{0.77}$ alloy, two distinct regimes are observed, both associated with sputtering. No swelling was observed. The onset of pore formation, that is, the beginning of stage II, is shifted to higher fluences as the Ge content decreases in the alloys. The threshold fluence for pore formation can be estimated to be 8×10^{15} ions/cm^2 and 1×10^{17} ions/cm^2 for $Si_{0.17}$ $Ge_{0.83}$ and $Si_{0.23}$ $Ge_{0.77}$, respectively."

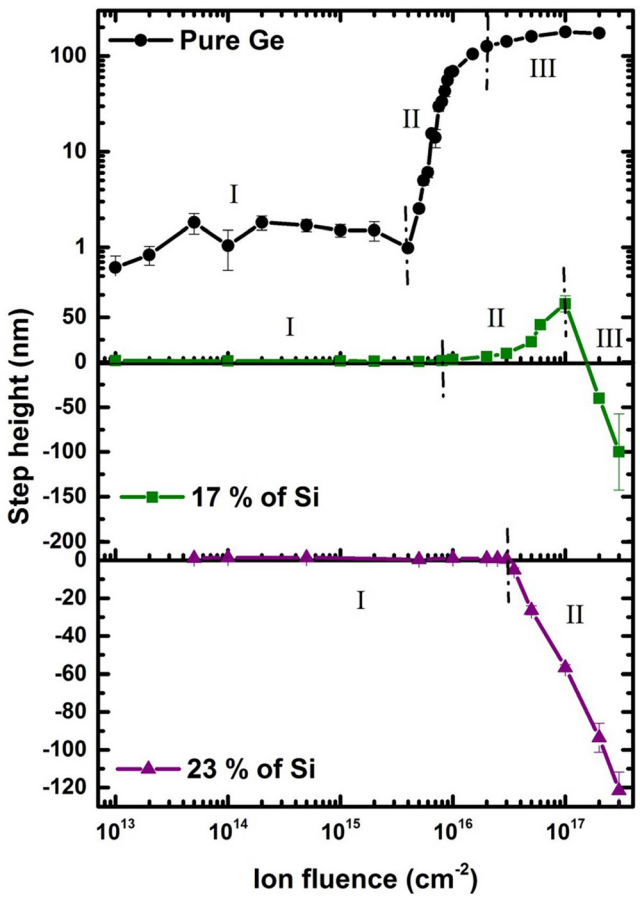

FIG. 5.

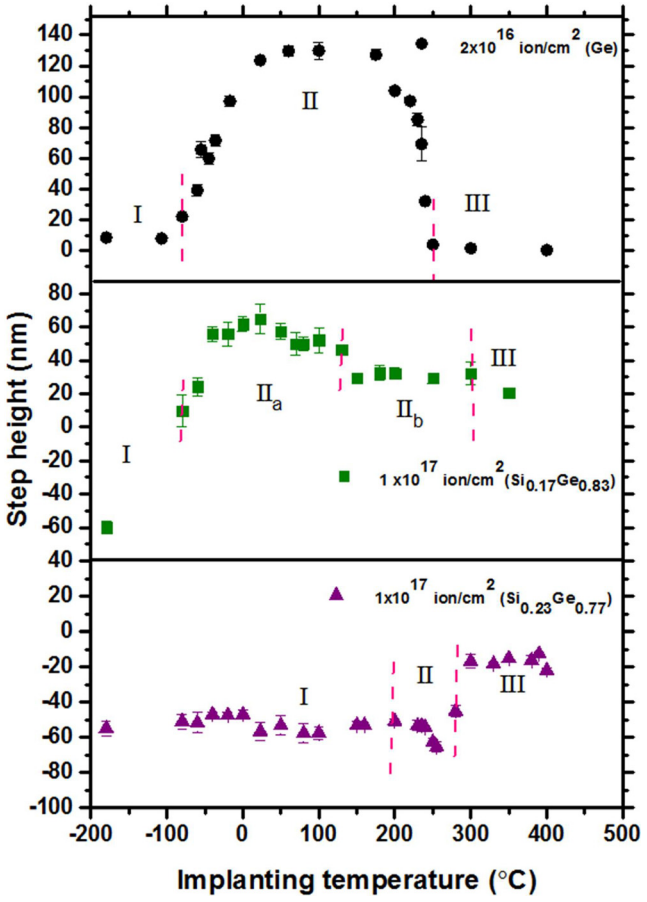

FIG. 6.

4. Replace on page 7, right column, the part of the paragraph beginning with "Again…" and ending with "…still present as shown in Figs. 9(c) and 9(f)." with the following: "Again a somewhat different temperature behaviour than in Ge and $Si_{0.17}$ $Ge_{0.83}$ can be found in $Si_{0.23}$ $Ge_{0.77}$. The step height profile indicates three broad regimes. The PVSEM and XTEM images indicate structures that differ markedly from that of Ge and $Si_{0.17}$ $Ge_{0.83}$. Up to a temperature of about 200 °C (regime I), no pores can be observed and no significant step heights are measurable. We note that a clear porous structure is formed at a higher fluence of 2×10^{17} ions/cm^2 at RT as shown in Figs. 1(g) and 3(g), and the absence of clear porosity in stage I in Fig. 6 may be due to the fact that the fluence of 1×10^{17} ions/cm^2 is not high enough in this temperature region to initiate porosity. At 100 °C, the onset of pore formation can be seen in the PVSEM (see Figs. 9(a) and 9(h)), presumably via void clustering at the sample surface. This phenomenon was also shown by Darby *et al.*[12] and supports the suggestion of a surface nucleation mechanism of void formation. The regime II from about 200 °C–300 °C, although it has a similar step height to that of I, is characterised by a thin pore layer at the sample surface as is shown in Figs. 9(b) and 9(e). A factor of two reduction in sputter erosion occurs between regimes II and III, and very surprisingly, pore formation appears to be still present as shown in Figs. 9(c) and 9(f)."
5. On page 9, left column, first paragraph, delete "$Si_{0.23}Ge_{0.77}$" from the last sentence.
6. On page 9, left column, second paragraph, replace "again small" with "sputtering."
7. On page 9, right column, first paragraph, line 17, replace the sentence beginning with "For example…" with: "For example, the drop in the volumetric swelling from stage II_a to II_b in the $Si_{0.17}Ge_{0.83}$ alloy and the step height change from II to III for the $Si_{0.23}Ge_{0.77}$ alloys are conceivably the result of a temperature-dependent (preferential) sputtering effect."

Reasons for the erratum:

The original paper[1] contained two figures where the y-axis was (in part) incorrectly labelled. The erratum corrects this error and also corrects the text in which these figures are referred. The overall conclusions of the paper are unchanged. However, correcting the figures has allowed us to reinforce the importance of sputter erosion at high implant fluences and its effect on the microstructure of the materials. In particular, the original figures accidently showed a swelling effect in SiGe alloys implanted at room temperature and at different elevated temperatures, particularly at high fluences, whereas the actual data indicated the role of sputter erosion as the fluence was increased. The added discussion that includes the role of sputter erosion actually better supports the main conclusions of the paper.

[1]H. S. Alkhaldi, F. Kremer, T. Bierschenk, J. L. Hansen, A. Nylandsted-Larsen, J. S. Williams, and M. C. Ridgway, J. Appl. Phys. **119**, 094303 (2016).