Beitrag ID: **175** Typ: **Oral**

Comprehensive analysis of the recrystallization effect induced by swift heavy ions in silicon carbide

Dienstag, 19. Mai 2015 11:50 (20 Minuten)

This contribution discusses recent results on the recrystallization effect [1,2] induced by swift heavy ions (SHI) in pre-damaged silicon carbide. The recrystallization kinetics was followed by using increasing SHI fluences and by starting from different levels of initial damage within the SiC samples. The quantitative analysis of these data shows that the recrystallization rate depends drastically on the local amount of crystalline material: it is nil in fully amorphous regions and becomes more significant with increasing amount of crystalline material. For example, in samples initially nearly half-disordered, the recrystallization rate per incident ion is found to be 3 orders of magnitude higher than what it is observed with the well-known IBIEC process using low energy ions. This high rate can therefore not be accounted for by the existing IBIEC models. A comprehensive quantitative analysis of all the experimental results indicates that the SHI induced high recrystallization rate can only be explained by a mechanism based on the melting of the amorphous zones through a thermal spike process followed by an epitaxial recrystallization initiated from the neighboring crystalline regions if the size of the latter exceeds a certain critical value. Finally, this quantitative analysis also reveals that the molecular dynamic (MD) calculations [3,4] supposed to reproduce the recrystallization phenomenon are actually far from being realistic since they lead to a recrystallization rate per incident ion which is about 40 times higher than the experimental value [5].

[1] A. Benyagoub, A. Audren, L. Thomé, F. Garrido, Appl. Phys. Lett. 89, 241914 (2006).
[2] A. Benyagoub, A. Audren, J. Appl. Phys. 106, 083516 (2009).
[3] A. Debelle, M. Backman, L. Thomé, W. J. Weber, M. Toulemonde, S. Mylonas, A. Boulle, O. H. Pakarinen, N. Juslin, F. Djurabekova, K. Nordlund, F. Garrido, D. Chaussende, Phys. Rev. B 86, 100102(R) (2012).
[4] M. Backman, M. Toulemonde, O. H. Pakarinen, N. Juslin, F. Djurabekova, K. Nordlund, A. Debelle, W. J. Weber, Comput. Mater. Sci. 67, 261 (2013).
[5] A. Benyagoub, arXiv:1402.3200 (2014).

Autor: Dr. BENYAGOUB, Abdenacer (CIMAP-GANIL (ex CIRIL-GANIL))

Vortragende(r): Dr. BENYAGOUB, Abdenacer (CIMAP-GANIL (ex CIRIL-GANIL))

Sitzung Einordnung: Session 5

Track Klassifizierung: 04 - Semiconductors