

High-dose boron and silver ion implantation into PMMA probed by slow positrons: Effects of carbonization and formation of metal nanoparticles

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Abstract

© Published under licence by IOP Publishing Ltd. The Doppler broadening slow positron beam spectroscopy (SPBS) data for the previously observed effect of carbonization in high-dose ($> 10^{16}$ ion/cm²) 40 keV boron-ion-implanted polymethylmethacrylate (B:PMMA) and another one obtained for the effect of formation of metal nanoparticles in high-dose 30 keV silver-ion-implanted polymer (Ag:PMMA) are compared. Following to the Doppler broadening SPBS results, a difference in the high-dose ion-irradiation-induced processes in B:PMMA and Ag:PMMA is detected.

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References

- [1] Sviridov D V 2002 Russ. Chem. Rev. 71 315
- [2] Stepanov A L 2004 Tech. Phys. 49 143
- [3] Wasserman B, Braunstein G, Dresselhaus M S and Wnek G E 1983 Mater. Res. Soc. Symp. Proc. 27 423
- [4] Lee E H, Rao G R and Mansur L K 1992 J. Mater. Res. 7 1900
- [5] Bridwell L B 1992 Solid State Phenomena 27 163
- [6] Lee E H, Rao G R, Lewis M B and Mansur L K 1993 Nucl. Instr. Meth. Phys. Res. B 74 326
- [7] Rao G R, Lee E H and Mansur L K 1993 Wear 162-164 739
- [8] Kavetskyy T, Tsmots V, Kinomura A, Kobayashi Y, Suzuki R, Mohamed H F M, Šauša O, Nuzhdin V, Valeev V and Stepanov A L 2014 J. Phys. Chem. B 118 4194
- [9] Kavetskyy T, Nowak J, Borc J, Rusnák J, Šauša O and Stepanov A L 2016 Spectr. Lett. 49 5
- [10] Kavetskyy T, Tsmots V, Nowak J, Kuczumow A, Kinomura A, Kobayashi Y, Suzuki R, Mohamed H F M, Šauša O, Nuzhdin V, Valeev V and Stepanov A L 2016 Mater. Sci. Forum (Proc. "ICPA-17 IC Positron Annihilation 2015") in press
- [11] Stepanov A L, Abdullin S N, Petukhov V Yu, Osin Yu N, Khaibullin R I and Khaibullin I B 2000 Phil. Mag. B 80 23
- [12] Stepanov A L 2010 Rev. Adv. Mater. Sci. 26 1
- [13] Maier S A, Kik P G, Sweatlock L A, Atwater H A, Penninkhof J J, Polman A, Meltzer S, Harel E, Requicha A A G and Koel B E 2003 Mater. Res. Soc. Symp. Proc. 777 T7.1.1
- [14] Boldyryeva H, Kishimoto N, Umeda N, Kono K, Plaksin O A and Takeda Y 2004 Nucl. Instr. Meth. Phys. Res. B 219-220 953
- [15] Boldyryeva H, Umeda N, Plaksin O A, Takeda Y and Kishimoto N 2005 Surf. Coat. Technol. 196 373
- [16] Galyautdinov M F, Nuzhdin V I, Fattakhov Ya V, Farrakhov B F, Valeev V F, Osin Yu N and Stepanov A L 2016 Tech. Phys. Lett. 42 182
- [17] Nagashima Y, Hakodate T, Miyamoto A, Michishio K and Terabe H 2009 J. Phys.: Conf. Ser. 194 012039

- [18] Saito F, Yotoriyama T, Nagashima Y, Suzuki Y, Itoh Y, Goto A, Iwaki M, Nishiyama I and Hyodo T 2004 Mater. Sci. Forum 445-446 340
- [19] Saito F, Yotoriyama T, Nishiyama I, Suzuki Y, Goto A, Nagashima Y and Hyodo T 2014 Phys. Chem. Chem. Phys. 16 26991
- [20] Stepanov A L, Nuzhdin V I, Valeev V F, Galyautdinov M F, Nuzhdin E V, Safina I R and Kavetskyy T S 2015 Intern. J. Appl. Fund. Res. 8 676