

Evidence of blocking effects on 3-keV Ne⁷⁺ ions guided through nanocapillaries in polycarbonate

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We studied the dynamic properties of ion guiding through nanocapillaries etched in insulating polycarbonate (PC). Capillaries with diameters of 95 and 165 nm and a length of 10 μm were used. In a further sample, the capillaries had a diameter of 175 nm and a length of 30 μm . A few additional measurements were made using capillaries in polyethylene terephthalate (PET). The temporal evolution of the intensity and the angular distribution of the transmitted ions were studied by measuring transmission profiles as a function of the charge deposited on the sample surface. The tilt angle of the capillary axis was varied from 0° to 5°. The mean emission angle of the transmission profiles exhibit pronounced oscillations, similarly as in previous measurements using PET. However, for PC, nearly an order of magnitude more charge needs to be inserted into the capillaries to accomplish the oscillations. In contrast to PET, with PC, we observed a strong decrease of the profile intensities with irradiation time. This observation provides evidence of blocking effects on the ions, which are likely to be due to a repulsive field produced by significant charge deposition inside the PC capillaries.