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Quantification and inhibition of the gas polymerization process in timing RPCs

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Aging of glass RPCs has been extensively studied over the last years, with most authors referring effects such as an increase of dark counting rate, reduction of the counter efficiency and the appearance of deposits over the electrodes surfaces.
Previous studies have shown that the deposit on both glass electrodes (cathode and
anode) is essentially formed by olygomers of tetrafluoroethylene and its derivatives [1]. Knowing the nature of the deposit, the next logical step, and the aim of this study, is to find the conditions to minimize or eliminate the formation of the deposit. This requires inevitably the quantification of the deposit in order to properly evaluate the success of the variations to be introduced in the gas mixture composition
The majority of the known processes of polymerization of ethane derivatives have an
initiation step for the formation of the reactive species that catalyse the polymerization. The addiction of chemical species that react with the reactive species more efficiently than tetrafluoroethylene - inhibitors of polymerization - could be the most effective way to eliminate the formation of the deposit.
In this work will be presented studies about the methodology for the quantification of
the deposit, the relationship with the experimental conditions used in the operation of the detector (drawn current and integrated charge), and the advances in the use of polymerization inhibitors to avoid the formation of the deposits.
[1] S. Gramacho et al., A long-run study of aging in glass timing RPCs with analysis of the deposited material, Nucl. Instrum. and Meth. in Phys. Res. A 602 (2009) 775-779

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