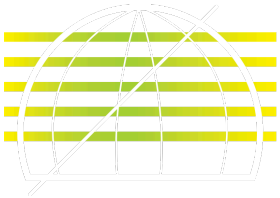

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Measurements of fluoride production in Resistive Plate Chambers

Thursday 29 September 2022 14:20 (3 minutes)

Resistive Plate Chambers (RPCs) are operated with a humidified gas mixture made of C2H2F4, SF6 and iC4H10. It is well known that under the effect of high electric field and radiation, the C2H2F4 molecule breaks into several compounds and free fluoride ions, which can accumulate under gas recirculation and could be harmful for the long-term detector operation. Furthermore in presence of water, the free fluoride ions become hydrofluoric acid (HF), a very reactive compound. The HF production depends on several factors as radiation rate, gas flow, detector current and gas mixture.
In this study we developed and tested two different set-ups for the HF concentration measurements by using an Ion Selective Electrode (ISE) station. The measurement on the HF production were performed on 2 mm gas gap bakelite RPC detector irradiated at the CERN Gamma Irradiation Facility (GIF++) with different absorption factors. Several gas mixtures were tested to understand how the formation of HF is affected. The HF production of the standard gas mixture was compared with the one of the standard gas mixture with the addition of 30% CO2 at several gamma rates. Different concentrations of SF6 were also investigated to understand if and how the SF6 could affect the HF production. Finally, two gas mixtures containing HFO1234ze, C2H2F4 and He or CO2 were used to study the RPC HF production in presence of the HFO1234ze, which is less stable in atmopshere with respect to the C2H2F4.

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