are used as cathodes can, for test purposes, be used as anodes and the secondary scintillation around them can provide valuable information. The possibility of looking, in a simple way, for some characteristic spectral features can as well turn out to be useful. The spectral characteristics of the emission from some excited species might be a very sensitive probe of the local electric fields and their gradients, of course, much more sensitive than, for example, charge gains. We remark that the first CCDs picture of microstrip gaseous detectors were obtained a few years ago [7]. Useful discussions with Fabio Sauli for its use as a test method, as well as for providing the GEM foils, are acknowledged. The present work was supported by contracts CERN/P/FAE1099/96 and CERN/P/FAE1143/97.

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Dynamic Behaviour in Resistive Detectors

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Introduction

The effect of counting rate on the efficiency (or gain) of resistive detectors has been reported for a wide range of operating conditions and is normally attributed to the reduction of the effective voltage across the gas gap, according to the equation $V_{eff} = V_o$ - RI, where V_o, I and R are the applied voltage, the operating current and the electrode resistance, respectively [1-3]. In most cases, the studies were performed assuming a stationary regime and only a few authors refer to the dynamic behaviour of the detectors [2,4]. This effect is particularly important for spark mode operated RPCs, where a small area around the discharge spot remains inactive during a given period of time, thus limiting their rate capability. Some authors [5,6] conclude that this dead time is of the order of $\rho\epsilon\epsilon_o$, where ρ, ϵ and ϵ_o are the bulk resistivity, the static dielectric constant and the permittivity of vacuum, respectively, and treat the dielectric as equivalent to a simple RC circuit. We used this approximation, in a previous work [7], to predict the transient behaviour of a proportional cylindrical counter with a glass tube as cathode, working under an irradiation rate for which the "mean effect" due to consecutive events results on a "current dependent" behaviour. The resistivity was measured during the test and for the dielectric constant the value given by the manufacturer was considered. The variation of the pulse amplitude with time was measured and compared with that expected from calculations. It was found that both curves could be fitted by a sum of two exponentials plus a constant term that corresponds to the pulse amplitude at equilibrium, but the experimental time constants were about one order of magnitude larger than those computed. Electric measurements of Crotty et al. [2], showed that the discharge of a phenolic sheet did not follow a single exponential decay law, and that the time constants were also larger than expected. In order to clarify the role of the $\rho\epsilon$ value on the relaxation of the detectors it was decided to study the electric properties of the materials and further investigate the relaxation mechanisms under irradiation conditions.

Experimental Setup

The experimental data were obtained with two different detectors: a cylindrical counter and a parallel plate chamber, both operated in the proportional mode. The cylindrical counter, similar to the one described in previous papers

[7,8], consists of a glass tube (ϕ_i = 12.7 mm), supplied by Schott, with a stainless-steel anode wire stretched along its axis. In the parallel plate chamber, the anode is a common window glass plate, manufactured by Saint-Goban (COVINA). The gas mixtures, Ar + 10%CH_4 and Ar + 20%C_2H_6, at atmospheric pressure, flow continuously, at room temperature, through the cylindrical and the parallel plate chambers, respectively. The cylindrical counter was irradiated, through the glass wall, by 22 keV X-rays. The charge gains were measured using either a conventional charge amplifier electronic system and a multichannel analyser or an electrometer. For the study of the transient effects, the signals from the amplifier are fed into an CAMAC ADC and then recorded by a computer. The V-I characteristics of all the samples were measured using up to 1000 V, and all results under irradiation showed an ohmic behaviour. The variation of the pulse amplitude as a function of time for both detectors under constant applied voltage and changing counting rate were obtained for different apllied voltages. It was found that for the lower current densities a simple exponential plus a constant term fits well the experimental data, whereas for higher currents a sum of two exponentials plus a constant term was needed. The time constants show a tendency to decrease with increasing counting rate and are similar to those associated with the decay of the depolarisation current. However, in the electric measurements no variation of the time constants with the applied voltage was observed.

Conclusion

In the present work, the electric measurements show that these glasses feature a complex relaxation mechanism and, therefore, cannot be treated as equivalent to simple RC circuits. Accordingly, the time evolution of the amplitude of the charge signals in our resistive detectors is expected to be represented by a complex function. However, it was found that most of the experimental data can be fitted by a two exponential decay plus a constant term. Although the associated decay constants are not directly related to the fundamental processes, they are characteristic of a particular material and give an idea of how fast is the effective relaxation of the dielectric. These constants depend on the rate and may be larger up to a factor of 10 or of the order of the $\rho\epsilon\epsilon_o$ value. The influence of the counting rate, gain, electrode thickness, resistivity or other parameters on the time constants is still under investigation.

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ASPECTOS NA AVALIAÇÃO DE SEGURANÇA RADIOLÓGICA EM UMA INSTALAÇÃO NUCLEAR PELO PLANO DE PROTEÇÃO RADIOLÓGICA OCUPACIONAL

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