POLYMER ELECTROLYTES IN SENSORS FOR HIGH-VOLTAGE MACHINES

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Introduction

Sulphur hexafluoride, used in the instruments and the transformers HV a EHV, allows more effective construction of the equipment specially in the hard conditions, which means conditions on the development and industrial centres and in the extreme operating conditions in the area of the transmission and the distribution of electricity [2].
For using in the electrotechnics it has its benefits (compared to the solid and liquid insulators):

- high specific dielectric strength (in usual conditions just about 2.5 times more than air) and smaller volume at the elevated pressure
- regenerative capability (the dielectric strength is recovered after the breakdown to its initial value)
- small pressure rise while by the extinction of the electric breakdown or arc (it increases by warming up and later goes back to starting value).

Basic characteristics of SF_6

This synthetic gas of the inert nature is colourless, odourless, fire-resistant and insoluble in the water. It is one of the heaviest gases. In the liquid state exists only at pressure higher than atmospheric, at the normal pressure is in the gaseous state, which by heat of sublimation -63.8 °C goes straight into solid state. It is appurtenant to the electronegative gases. In other words, it is able to trap the free electrons [2].

Sulphur hexafluoride is a gas that is electronegative and in a regular condition in inert gas also. Thermal or electric charge is able to make its puncture that makes a dissociation of part of gas for a lower sulphur hexafluoride. Reactive products of dissociation SF_6 are having very detrimental influence to the duality of isolation material of valve tie of triplet on a epoxy resin base specially, that exposed to thein operation.

Previous research

The main topic in the basic work was an problem analysis of an influence of disruptive products of sulphur hexafluoride on composite materials on epoxy resin base [2].

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The practice part is specially set for changing of electric characteristics of insulator, detailed influence of this product and also to the quantitative analysis of the most of oxides and fluorides that are produced during the sparking.
It was about modelling of exposion in an experimental chest. There was a specimen with three electrodes system on it with helpin of conductive graphitic varnish SIB 643. It was used for the experiment examples number 1, 2, and 3.
The burs chest was full of SF_6 and was underpressured like 0.1 MPa and without filling and it was under electric sparkling discharges. Sparkling was coming every 60 minute. After each sparkling was measured on the megaohmeter IM6 inside and outsider resistance and it was re-counted for inside and outsider conductivity.
It showed an extreme decrease of raising of inside and outside resistance of insulator because of combustion gas SF_6. It got on one of these examples an making of conductive way between measuring and protective electrode. This way is going to make a puncuter and damaging of the machine in using, destroying of distribution point that is going to brake and electrical energy, unsafenes of human being and property. The ABB Brno company uses this material for the production of the rods of the high-tension switch.

Resolution Sensor

Solid-state electrochemical sensors are an applicable part of gel electrolyte. The main task was to product easy in operation electrochemical sensor that is going to follow a contain of hydrogen fluoride in high-voltage facilities that contain sulphur hexafluoride [3]. This sensor is not supposed to contain a liquid electrolyte because it could lead into putrefaction of its steam in electrical discharges

Gel preparation

The preparation is based on mixing these three components [1]:

- methylmethacrylate (MMA) – stabilised 10 - 100 ppm of hydrochinon monomethylether,
- oligomeric resin of PMMA – white powder that is distributed as Superacryl ® (Spofa Dental, Czech Republic), contains 1 wt.% of dibenzoylperoxide as the polymerisation initiator,
- optional liquid part – specify a chemical character of gel; in the case of gel for sensors were we using solution of dibutylamine in propylene carbonate

As an optimal was choosed this ratio of components upon to many experiments: 1.50 ml MMA + 0.70 g oligomeric resin + 1.00 ml optional component.
The mixture was mixed and flowed on the Petri dish between two rustless sieves that were split by 3 dilatation screens and was put in to the dessicator for five days at the room temperature. Polymerisation was held in the atmosphere of monomeric MMA to reduce monomer vaporization from the mixture to preparing gel. After this was the specimen put in to the test chamber and was ready to experiment after filling by SF_6 with over-presure 0.1 MPa.

Conclusions

Polymeric electrolytic gels are the most progressive electrolyte in these days. Common advantage is in possibility to spread and formation in a semi fluid form. This characteristic makes very cheep and very faithful technological procedures.

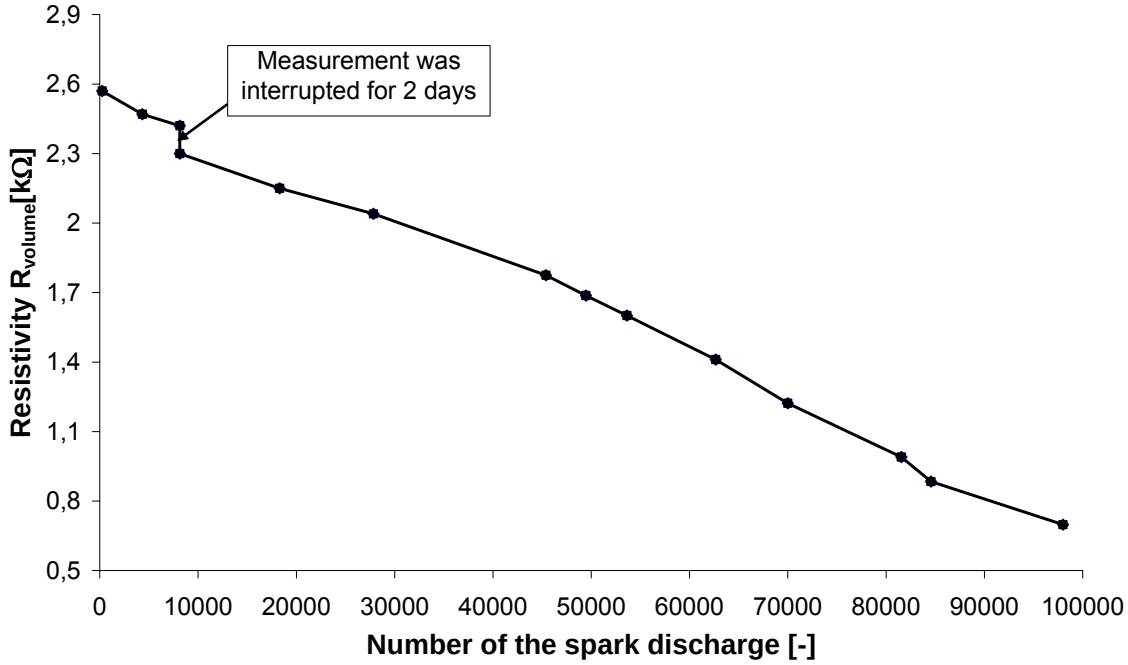

Fig. 1 *Dependence of resistivity on the number of spark discharge characteristic of the sample 1.*

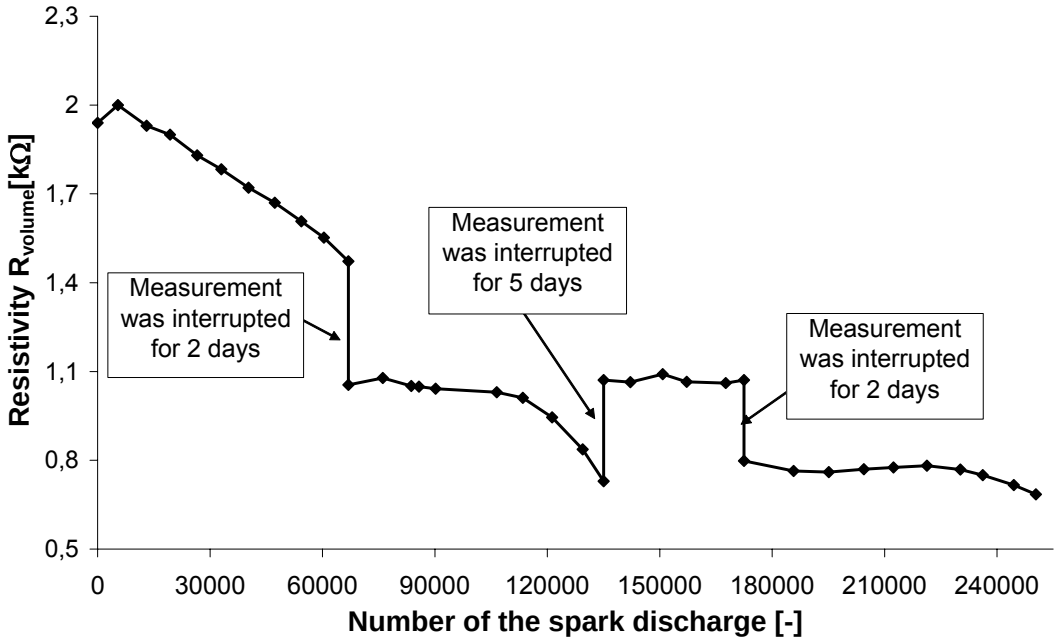

Fig. 2 *Dependence of resistivity on the number of spark discharge characteristic of the sample 2.*

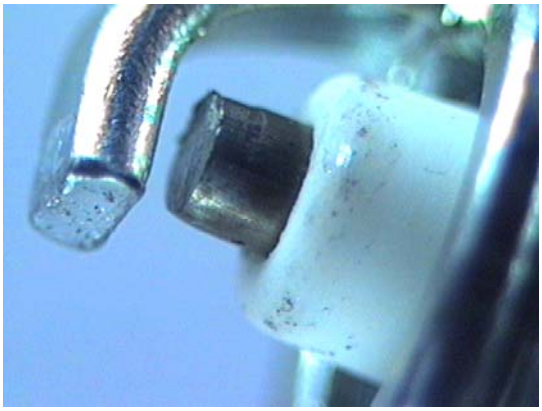

Fig. 3 *new spark plug*

Fig. 4 *spark plug after experiment*

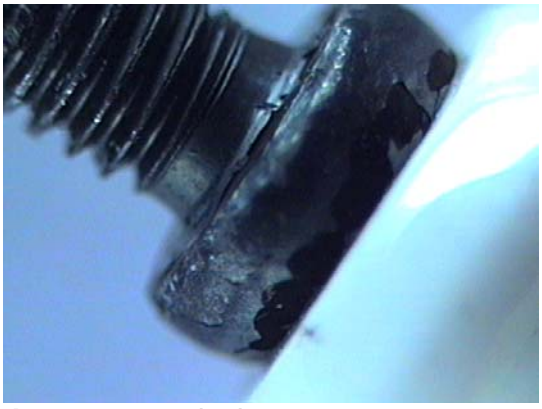

Fig. 5 *new spark plug*

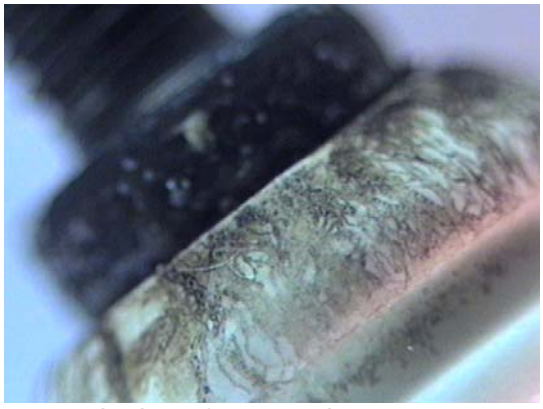

Fig. 6 *spark plug after experimen*

Acknowledgements

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