ABSTRACT

The 2-furfuraldehyde compound (2-FAL) is the main degradation product of cellulose-based Kraft paper, which is used for insulation of power transformers and can be detected and quantified in insulating mineral oil (OMI), which is used in most power transformers, by high performance liquid chromatography (CLAE). The increase in the 2-FAL concentration has been accepted as indicator of paper degradation. By other hand, the degree of polymerization (GP) of the paper can also be used for monitoring the quality of the solid insulator. However, such assay requests periodical sampling for the paper and, unfortunately, this procedure is not technically and economically viable.

In this work colorimetric methodologies were assessed for the determination of furanic compounds in OMI. Two analytic methods were used, the traditional one which uses aniline as a colorimetric reagent and a new one which uses barbituric acid and p-toluidine as selective colorimetric reagents for furanic compounds. For the validation of such methods, oil samples in service and 2-FAL standard solution prepared in OMI, were analyzed by spectrophotometry in the visible region and the obtained results were compared with the ones obtained by chromatography (CLAE). At the same time, OMI samples were aged in presence and absence of insulating paper with posterior determination of GP and furanic compounds concentration.

The obtained results have shown that it is possible to quantitatively determine the concentration of furanic compounds in OMI by using colorimetric methodologies. Both methodologies, the traditional and the new one, present similar responses when compared to the chromatographic one (CLAE) for the analysis of 2-FAL standard solutions. However, such colorimetric methodologies might generate false positive results in the analysis of OMI samples that are too degraded (interfacial tension < 30 dyn/cm) due to the interference of products from oil oxidation in the quantitative analysis. Such interference is considerably minimized in the new developed colorimetric methodology comparatively to the traditional one (aniline).