

High-Resolution Observation of Surface Charge Distribution Profiles by Electrooptic Effect on Twisted Nematic Liquid Crystal

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We previously reported the results of surface charge distribution on transparent insulating plates. In the study, we applied an electrooptic effect of twisted nematic (TN) liquid crystal to observe the surface charge. The amounts of charge and charge distribution patterns on a glass plate were simultaneously determined by transmitted light intensity of a TN liquid crystal cell; however, the resolution in the distribution pattern was only approximately $500\ \mu\text{m}$. This time, we improved the resolution to $50\ \mu\text{m}$ using a thin transparent insulating plate ($80\ \mu\text{m}$) and a coherent light source of the He-Ne laser, and succeeded in representing two-dimensional surface charge distribution, using image processing and computer graphics, in terms of multiple color images.

1. Introduction

A study of charge distribution has been carried out using various techniques including the dust figure technique,⁽¹⁾ probe scanning method⁽²⁾ and electron beam scanning method.⁽³⁾ The dust figure technique has been used in the study of electrical surface discharge in gasses.^(4,5) This technique is simple and relatively inexpensive. With this technique, the residual surface charge pattern produced by surface discharge can be visualized by spraying charged dust powder onto the surface; however, the amount of residual charge density cannot be measured. With the prob-