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A HEAT WAVE METHOD FOR THE MEASUREMENT OF THERMAL AND PYROELECTRIC PROPERTIES OF PYROELECTRIC FILMS

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Abstract An experimental technique is presented, which enables the simultaneous or consecutive measurement of the specific heat and thermal diffusivity, and of the pyroelectric coefficient and its spatial distribution in the same sample. The pyroelectric samples are in the form of thin films. The metal electrodes on the front and rear surface of the film are designed as thin film bolometers. The film is heated at one surface with intensity modulated radiation. With the film bolometers the temperature amplitude at the front and at the rear surface of the sample are measured. Simultaneously or consecutively the pyroelectric current is measured as a function of the modulation frequency. From the measured spectra, the thermal diffusivity, the pyroelectric coefficient and its spatial distribution inside the film can be calculated. The experimental method is applied to PVDF foils, the thermal and pyroelectric data of this polymer are analyzed as a function of the temperature.

INTRODUCTION

Pyroelectric polymers have gained much interest in recent years for various reasons. As examples, applications as thermal detectors for various spectroscopic methods[1] or for pyroelectric infrared detectors[2], especially integrated on a silicon chip[3] may be noted. Therefore, a method for the determination of the thermal and pyroelectric properties of such films is of interest. Glass[4] developed an ac-technique for the simultaneous determination of the specific heat and the pyroelectric coefficient. The sample is heated via the absorption of intensity modulated light. Simultaneously, the generated pyroelectric current and the temperature at the rear side of the sample are measured. The temperature recording is performed via thin wire thermocouples. The following paper describes an extension of this method. For the temperature recording the electrodes on both sample