METHOD AND SYSTEM FOR DETERMINING SECOND-ORDER NONLINEAR OPTICAL COEFFICIENTS

Main Technological Area ⟶ Materials

Keyword ⟶ Non-Linear Optics | NLO | Photonics | Maker-fringe | Polarization | Polymers

The invention relates to a method and to a system for determining second-order nonlinear optical coefficients of a sample. The method implies that two optical signals having respective polarization states interfere on the sample so that a second-harmonic optical signal is generated therefrom; power measurements are made on this signal as the polarization states change.

TECHNICAL SPECIFICATIONS

When an oscillating electric field is applied to a material, it induces the formation of electric dipoles, consisting of the atoms and molecules of which it is composed; these oscillating dipoles have a polarization that depends on the characteristics of the material. In the case of materials having a crystalline structure, but do not have a center of symmetry (non-centrosymmetrical materials), that polarization have non-linear characteristics with respect to the incident electric field, represented by a polynomial equation having various coefficients. In particular the second order coefficient characterizes the crystalline structure of the material and can be determined thanks to the method described in this invention.

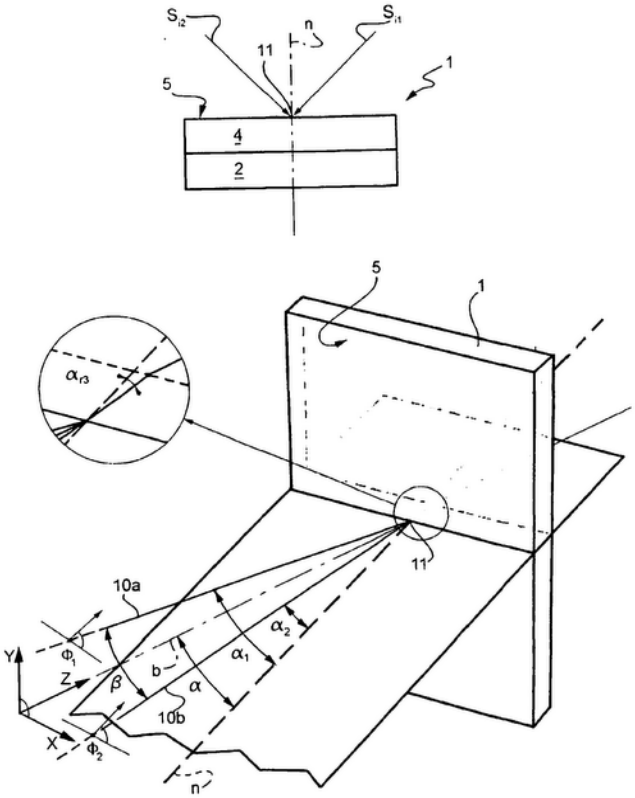

Figure 1 – Second-harmonic generation: geometrical scheme of principle

As can be seen in Figure 1, a specimen of optically non-linear material is impinged by two different optical pump signal (10a and 10b), coming respectively from different directions and which impinge in one and the same point on the surface of the sample, propagating itself by refraction inside the material and inducing second-order polarizations. By

measuring the power of the polarized components of the second harmonic signal (generated by non-linearity) with respect to those incidents, the non-linear coefficient of the second order will be determined.

INNOVATION/ADVANTAGES

The method enable the determination of the non-linear optical coefficients of the second order of a sample material, without requiring its rotation.

Benefits:

• The method useful in particular for those materials whose signal generated during sampling is strongly influenced by the rotation of the specimen or whose size is comparable to the wavelength.

FIELDS OF APPLICATION

Measurements	Characterization of nanostructured thin films Coating film inspection during semiconductors production process
Fotonica	Devices characterization and check
Biophotonics	Diagnostic instruments for tissue characterization

PATENT INFORMATION

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