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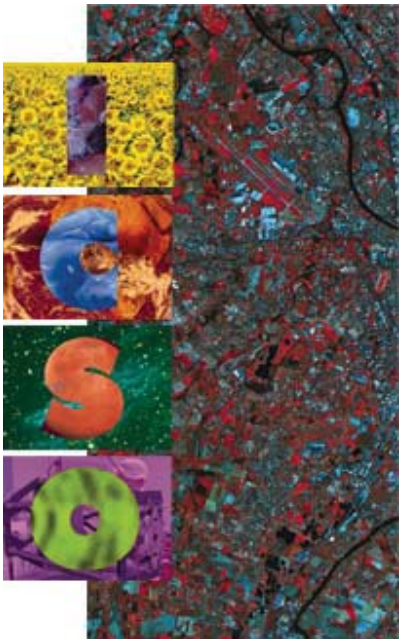

New features of recording equipment based on photothermoplastic medium for earth observation from space

V. K. Rotaru

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ABSTRACT

NEW FEATURES OF RECORDING EQUIPMENT BASED ON PHOTOTHERMOPLASTIC MEDIUM FOR EARTH OBSERVATION FROM SPACE

V.K. Rotaru

State University of Moldova, Department of Physics,
60 Mateevich str., Kishinau, MOLDOVA, MD 2009

Photothermoplastic medium (PTPM) is a non-silver two-layer, semiconductor-thermoplastic, structure for optical data recording, which is radiative resistant. It allows to record photographic, holographic and other kinds of optical data without any wet chemical development that giving the maximal economic effect for Space and airborn usage.

Optical data of photothermoplastic recording are characterized by simplicity of developing and erasing processes; unlike the xerography it does not need any special developing material; unlike vidicons it does not need any complex electronic equipment. To record data on PTPM only electric power (~60 W) is necessary.

The property of radiation resistance makes this systems particularly useful for remote sensing of the different objects from Space. The main PTPM's disadvantage when comparing with AgHal films is relatively low photographic sensitivity values of 7-10 $Lx^{-1}s^{-1}$, but it can be compensated by using of high-speed lens.

We elaborated a PTPM which is photosensitive in different spectral ranges, stable to radiation light mark, being able to record halftones and increasing the resolution of lens - PTPM system at the frequencies close to limiting characteristics of the lenses. Such a medium can work in a circular scheme providing the multiple write-erasure mode of recording. The image obtained on PTPM can be transmitted to the observation station instantly or with a necessary delay.

During image recording process a PTRM is placed into the camera and the heating element is switched on. When applying the voltage to the coroning electrode whith simultaneous exposure corresponding to the photosensitivity of a PTPM, the creation of visual image takes place in the form of phase relief of the layer surface being deformed. A duration of the exposure is determined both by the slit width of the thermostatting unit and the diaphragm size of the camera optical train (in the case of slit recording technique).

The equipment foresees image erasing mode to provide repeatable recording. A number of repeating record -erasure cycles may be up to 30 depending on the kind of PTPM. The resolution of PTPM is a function of a thermoplastic layer thickness and varies from 200 to 1800 mm^{-1} . PTPM may secure information registration in a broad spectral range from X radiation up to IR. In case of special problems the range of spectral sensibility may be restricted up to 0,1 μm with continuous distribution along the whole visible range.

Camera is a monoblock which includes special light intensive (1:1.2) eight lens objective (F=99,3 mm) and angle of field-of-view $2\omega = 16°$. Visual resolution is 960 mm^{-1} , weight - 7 kg. Spectral range 0,45-0,65 μm. Precise tape-drawing mechanism is attached to the objective. This mechanism secures movement of the PTPM with the speed of 1,5-2,5 mm/s what is sufficient for compensation of displasement of the Earth surface. The ground tests using stroke optical focusing pattern showed resolution of 240 mm by simultaneous movement of the apparatus and film relative to the optical focusing pattern. PTPM has controlled sensibility. Its sensibilisation is performed by corona electrode directly at the moment of photographing. When slit recording method is used the record quality depends on flexible substrate noise. Process of image registration on the PTPM manufactured from glass-type radiation resistant semiconductors allows to put in information with tremendous rate determined by film frame size and objective resolution up to 10^{10} bits per second.