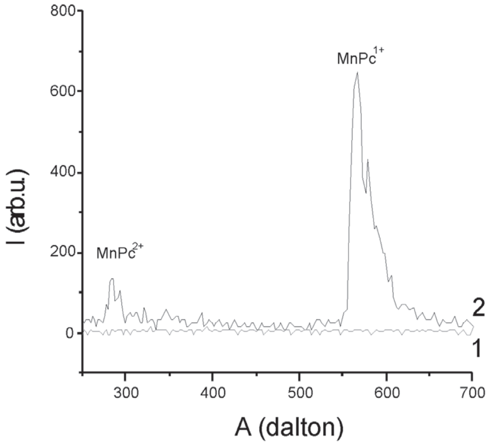

Рис. 2. Участок масс-спектра частиц, десорбированных с поверхности пленки MnPc лазерным излучением: 1 – до поступления молекул в ионный источник, 2 – в присутствии молекул в ионном источнике

При лазерной обработке поверхности органических пленок на основе MPc's в спектральной области собственного поглощения, происходит модификация пленки, сопровождающаяся десорбцией фрагментов молекул. Для пленок MnPc основные фрагменты идентифицированы как C_8H_4 (m/z =100), $C_8H_4N_2$ (m/z=128) и $C_8H_4N_2Mn$ (m/z=183). Наблюдается отличие в путях деградации MPc's под действием лазера в отличие от пиролиза либо воздействия электронного пучка. В частности в случае MnPc они проявляются в десорбции кроме изоиндольных фрагментов (m/z=183, m/z=128), бензольных фрагментов (m/z=100) и сохранением недекструктированных фталоцианиновых комплексов (m/z=567). Особое внимание в работе уделено исследованию формы молекулярного пика в масс-спектрах, сложная форма которого не укладывается в модельные представления с учетом только изотопного состава атомов в молекуле MnPc. При анализе масс-спектров учитывалась корреляция формы пика массы m/z=283 с формой молекулярного пика, которая идентифицирована нами как двукратно ионизованная молекула фталоцианина марганца.

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ANISOTROPY OF THE LINEAR MAGNETIC BIREFRIDENCE OF EUROPIUM IRON GARNET

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Rare earth (RE) iron garnets with narrow ferromagnetic resonance linewidths, very low hysteresis losses, and excellent dielectric properties have been widely applied in microwave devices in a wide range of frequencies (1–100 GHz), magnetooptical transducers and typically employed as magnetic recording media [1-20]. The general chemical structural formula for rare-earth iron garnets (REIG) can be written as $RE_3Fe_2Fe_3O_{12}$, with eight of these formula units per unit cell. With the overall symmetry being cubic, the space group of REIG is $Ia\bar{3}d$, $Ia\left(O_h^{10}\right)$ in which three special positions are occupied by magnetic ions. The garnet in fact does not allow distortion to lower symmetry owing to its non-efficiently packed structure, which makes the iron garnet structure unstable with increasing rare earth ionic radius.

We studied the crystal-optics properties of europium IG in the regions of the absorption bands of the rare-earth ion. Close attention was paid to the observation of those crystal-optics anisotropy features, which are connected with the change of the relative orientation of the magnetization vector *I* and the light wave vector. The investigation of the crystal-optics properties of europium IG in the region of the $^7F_0 - {}^7F_6$ absorption band of the rare earth ion Eu^{3+} has shown [10] that when the light propagates perpendicular to the magnetization (Voight geometry, $\vec{k} \perp \vec{I}$) the crystal is optically uniaxial.

2. Experiment

Using the method of flux growth under 10 bar of oxygen pressure, single crystals of $Eu_3Fe_5O_{12}$ were synthesized by B.V. Mill at Moscow State University. X-ray diffraction measurements were in agreement with the garnet $Ia\bar{3}d$, structure. Polished platelets – 100-250 mm thick-oriented perpendicular to the [110] and [100] axes were obtained from the same «as grown» crystal. Magneto-optical measurements were performed at a temperature of 82K and 295K under a magnetic field of up to 25 kOe on the spectrometer facility, characterized in [2, 3, 6]. MLB spectra were obtained in energy region and 4900-5100 cm^{-1} with a high optical resolution 0.12 cm^{-1} with the help of a modulation technique. The experimental accuracy is estimated at $\pm 2\%$. It is noted that the samples are cooled at the lowest temperature in the absence of a magnetic field prior to MLB measurements. The angle of rotation of the samples was measured with 0.1º accuracy.

3. Results

The dependence of the intensity I(w) of the light transmitted through the sample, as well as of the intensity I_0(w) of the light without the sample, was registered with an automatic recorder.

Fig. 1 shows the measured absorption coefficient $k'(\hbar\omega)$, in the Voight geometry, of an $Eu_3Fe_50_{12}$ plate cut in the (110) plane, at $\vec{k} \| [110]$, $\vec{E} \perp \vec{I} \| [\bar{1}10]$, Fig. 2 shows the $n'(\hbar\omega)$ spectra calculated on these results with the help of the Kramers-Kronig relations (n' is the contribution made to the refractive index by the light absorption by the RE ions).

The difference between $k'(\hbar\omega)$ and $n'(\hbar\omega)$ at two *E* orientations proves that the crystal is optically biaxial. This difference in *k*' is a maximum at the frequency of 5450 and 5500 cm^{-1}. It reaches 60 – 70 per cent.

As one can see in Fig. 2 $Dn = n'_{100} - n'_{110}$ reaches the value of $1x10^{-3}$ and reverses sign several times in the region of the absorption band.

Thus the character of the optical anisotropy of the crystal depends on the relative orientation of the vectors *k* and *I*. No such effect had been observed before for $Eu_3Fe_5O_{12}$ in such geometry of the experiment to our knowledge.

Investigations of the MBL have shown that the anisotropy of the optical properties of an IG magnetized far from the absorption lines can be satisfactorily described with the aid of a dielectric tensor expanded in powers of the magnetization *I*. In general case a cubic crystal becomes optically biaxial upon magnetization, and the angle between the optical axes is determined by the orientation of the vector *I* in the crystal, namely, if *I* is directed along axes such as [111] and [100] the crystal is uniaxial, and in other directions of *I* it is in general biaxial.

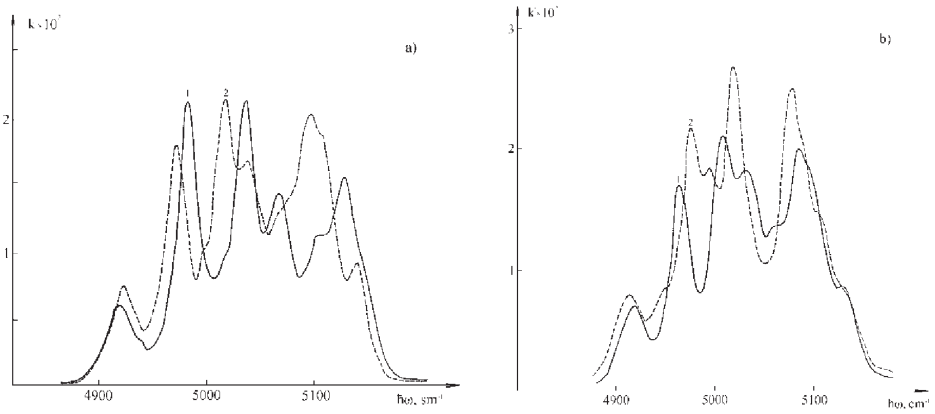

Fig. 1. Absorption spectra of EuIG:
$a - 1 - \vec{k}\,\|[110],\ \vec{I}\,\|[\bar{1}11],\ \vec{E}\,\|[\bar{1}10],\ 2 - \vec{k}\,\|[110],\ \vec{I}\,\|[\bar{1}10],\ \vec{E}\,\|[\bar{1}11];\ b - 1 - \vec{k}\,\|[110],\ \vec{E}\perp\vec{I}\,\|[\bar{1}10],\ 2 - \vec{k}\,\|[110],\ \vec{E}\perp\vec{I}\,\|[001]$

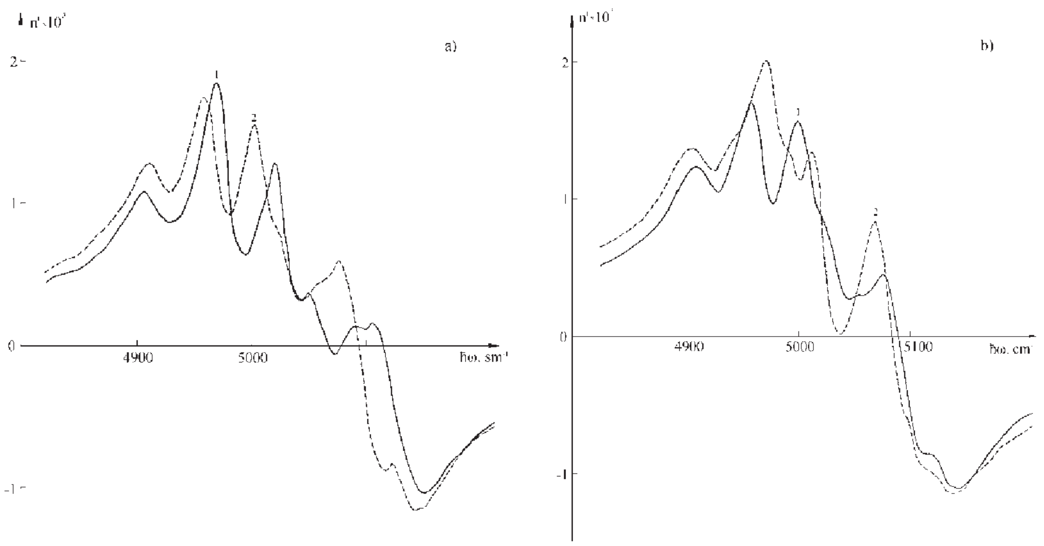

Fig. 2. Frequency dependences of the contribution made to the refractive index by the optical transition $^7F_0 - {}^7F_6$ of the Eu^{3+} ion of the EuIG:
$a - 1 - \vec{k}\,\|[110],\ \vec{I}\,\|[\bar{1}11],\ \vec{E}\,\|[\bar{1}10],\ 2 - \vec{k}\,\|[110],\ \vec{E}\,\|[\bar{1}11];\ b - 1 - \vec{k}\,\|[110],\ \vec{E}\perp\vec{I}\,\|[\bar{1}10];\ 2 - \vec{k}\,\|[110],\ \vec{E}\perp\vec{I}\,\|[001]$

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РАСЧЕТ АЭРОДИНАМИЧЕСКИХ ХАРАКТЕРИСТИК ВОЗВРАЩАЕМОГО ЛЕТАТЕЛЬНОГО АППАРАТА

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Компьютерное моделирование позволяет при помощи инженерных методов быстро проводить анализ аэродинамических характеристик летательных аппаратов [1, 2]. В работе предлагается создание инженерной программы определения основных аэродинамических характеристик разных формы тел. В работе представлены аэродинамические расчеты компоновок возвращаемого летательного аппарата (ВЛА) типов «Клипер, модель ЦАГИ» с помощью локального метода при различных числах Рейнольдса.

В данной работе используются выражения для элементарных сил давления и трения в форме работы [3].