

I. Kerr rotation in paramagnetic ZnMnSe.

II. Optical anisotropy found in ZnMnSe, probably due to in-plane strain, or atomic ordering.

III. Zeeman splitting of the conduction bands as function of Mn content.

IV. Free charge carrier parameters of ZnMnSe.

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**Our message**

**Experiment and model**

- Magneto-Optic Generalized Ellipsometry (MOGE) at RT on ZnSe and Zn$_{1-x}$Mn$_x$Se ($x=0.0, 0.13, 0.28$) in the spectral range from 70 to 650 cm$^{-1}$ and from 1.2 to 3.4 eV.
- Isotropic model dielectric function (MDF) for ZnSe and ZnMnSe (Phys. Rev. B 70, 04513, 2004).
- Observation of in-plane anisotropy in ZnMnSe (in absence of a magnetic field).
- Anisotropic MDF of ZnMnSe.
- MOGE (Kerr rotation) measurements of ZnSe and Zn$_{1-x}$Mn$_x$Se ($x=0.0, 0.13, 0.28$).
- MDF for Zeeman splitting in ZnMnSe (magnetic field induced birefringence).
- Charge transport parameters of low chlorine doped ZnMnSe.

**Setup**

- THz to infrared
- Visible-UV
- MBE (U. Karlsruhe)

**Experimental results**

- MOGE measurements in quasi-Kerr configuration for ZnSe, and Zn$_{1-x}$Mn$_x$Se. The Zn$_{1-x}$Mn$_x$Se sample shows a paramagnetic response for a photon energy corresponding to the band-to-band transition, while in ZnSe no Kerr rotation is detected.

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**Materials**

- ZnSe
- Zn$_{1-x}$Mn$_x$Se

The real and imaginary parts of the isotropic dielectric function obtained from the best match analysis of the GE experimental data.

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- Free charge carrier parameters

**Γ-Point CB effective mass**

<table>
<thead>
<tr>
<th>Material</th>
<th>$M[10^{12} \text{cm}^{-2}]$</th>
<th>$m^*[m_0]$</th>
<th>$\mu[10^2 \text{cm}^2/\text{Vs}]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>GaAs-sub.</td>
<td>10.5(1)</td>
<td>0.071(1)</td>
<td>20.5(1)</td>
</tr>
<tr>
<td>ZnMnSe</td>
<td>4.9(2)</td>
<td>0.086(2)</td>
<td>3.0(2)</td>
</tr>
</tbody>
</table>

corresponds to kp-calculations of the Γ-Point CB effective mass for Zn$_{1-x}$Mn$_x$Se


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**Graphs**

- Energy / eV
- Dielectric response
- Magnetic induced birefringence

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**Tables**

- Energy / eV
- Dielectric response

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**Notes**

- The Mueller matrix element $M_{ij}$ used to detect in-plane birefringence shows no signal in the studied spectral range.
- No signal was detectable from the MOGE experiment as shown by the $M_{12}$ and $M_{14}$ elements.

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**Acknowledgments**

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