NIR Spectroscopy - An introduction

OSRAM Team | 09/11/2018 | Regensburg

Light is OSRAM
Megatrend of “well-being”: Consumers want to know what’s in their food

Mobile spectroscopy required!

OSRAM OS as technology leader for innovative light sources
Spectroscopy enables material identification with the creation of a wavelength fingerprint

How does infrared spectroscopy work?

https://www.osram.com/os/applications/mobile-competence/mobile-competence-spectroscopy.jsp
Spectroscopy enables material identification with the creation of a wavelength fingerprint

How does it work?

1. Scan the **molecular makeup** of an object, like an apple

2. The device creates a **spectrum** specific to the object (wavelength fingerprint)

3. This spectrum is then analyzed in a cloud

What could it be used for?

Analysis of:

- **Vegetables & Fruit:** Water content, carbs, calories
- **Dairy products:** Calories, fat, proteins, water
- **Bodyfat**
- **Medication validation**

… and much much more
The world’s first infrared spectroscopy lab: Empower consumers to check what is in their food

Enabled by OSRAM’s broadband infrared LED “SFH 4735” → The first NIR broadband LED on the market!
Phosphor conversion to the infrared spectral range – Enabling technology for mobile spectroscopy

OSRAM OS SFH 4735

| Max forward current $I_{f,\text{max}}$ | 500 mA (DC operation) |
| Spectral flux at $I_f = 350$ mA | 1000 mA (pulse mode, D=0.005) |
| Radiant flux in NIR | 16 mW |
| $\lambda = 750$ nm | 60 µW/nm |
| $\lambda = 850$ nm | 45 µW/nm |
| $\lambda = 950$ nm | 45 µm/nm |

OSRAM OS SFH 4735 – OSLON Black Flat package
OSRAMs NIR LED awarded by CES Innovation Award 2018 and many others…

| SFH 4735 was CES 2018 Innovation Awards HONOREE in the Embedded Technologies product category |
| Other Awards and nominations |
| Elektronik Magazine „Product of the year 2017“ |
| Edison Award Finalist |
| EE Times Ace Awards Finalists |
| SPIE Photonics West 2018 Prism Awards |
NIR Spectroscopy is just at the beginning – there will be much much more…

Product roadmap

- SFH 4735 OSLON Black Flat
  - Half Angle ± 60°
  - 3.7 x 3.7 x 0.7 mm³

- In production SOP 09/2018
  - SFH 4776 SYNIOS
  - Half Angle ± 60°
  - 2.75 x 2.0 x 0.6 mm³
  - Increase by x 1.6

- SOP 11/2018
  - SFH 4736 OSLON Black
  - Half Angle ± 40°
  - 3.75 x 3.75 x 2.3 mm³
  - Increase by x 2.2

More to come!
Different demands can be satisfied by OSRAM’s NIR broadband portfolio

<table>
<thead>
<tr>
<th>Product portfolio</th>
<th>Designed for Mobile</th>
<th>Designed for Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SFH 4735 OSLON Black flat</strong></td>
<td><strong>SFH 4776 SYNIOS Package</strong></td>
<td><strong>SFH 4736 OSLON Black</strong></td>
</tr>
<tr>
<td><strong>Dimensions / Package</strong></td>
<td>3.7 x 3.7 x 0.7 mm³</td>
<td>2.75 x 2.0 x 0.6 mm²</td>
</tr>
<tr>
<td><strong>Halfangle</strong></td>
<td>± 60°</td>
<td>± 60°</td>
</tr>
<tr>
<td><strong>Total radiant flux in NIR (650 nm – 1050 nm, at 350mA)</strong></td>
<td>16 mW</td>
<td>24 mW</td>
</tr>
<tr>
<td><strong>Radiant intensity in NIR (650 nm – 1050 nm, at 350mA)</strong></td>
<td>5 mW/sr</td>
<td>8 mW/sr</td>
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</tbody>
</table>
| **Comments** | • First product on the market  
• Honored with many awards  
• Established package design | • Smallest dimensions  
• Improved phosphor material  
• Robust package | • Optics included  
• Improved phosphor material  
• Established package design |
Spectroscopy ecosystem consists of 3 main parts: NIR Emitter – Spectrometer – Software

Key building blocks in the Spectroscopy ecosystem

Integration / Packaging

- **NIR Emitter**
  - **OSRAM**
  - Opto Semiconductors

- **Spectrometer**
  - incl. IC detector, filter & optics
  - IC detector / CMOS suppliers,
  - Filter suppliers

Software

- incl. material knowledgebase

OSRAM can support with application know-how and is #1 for NIR emitters

**OSRAM**s knowledge, network and partnerships help to **accelerate the application development**

1) Includes associated electronics for Driving, Signal conditioning etc
Thank you.