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# Absorption Bands

There are strong absorption bands of many chemical agents at mid-infrared spectral range that allow their detection with sensor devices based on LED-PD optopairs. Some of these chemical agents and their absorption bands are presented here.

Although the spectra are the characteristics of the molecules, in a number of cases they overlap. The frequency of the fundamental vibrations varies with the atomic weight of the constituents. Further spectra exist due to overtones. These are in general much weaker, but there are still possibilities for these to be used for measurement purposes. The absorption strengths also vary with different molecules, so that different path lengths should be provided to obtain adequate absorption in the required sensitivity range. Small measuring cell can be an advantage, notably when rapid response is needed (such as in medical applications).

Here are the absorption bands of the main compounds:

| | | | |
|---|---|---|---|
| $CH_4$<br>1.65;2.30 μm;<br>3.2÷3.45 μm | $CO_2$<br>2.00; 2.65 μm;<br>4.2÷4.3 μm | $H_2O$<br>2.65÷2.85 μm;<br>1.86÷1.94 μm | $N_2$<br>4.0÷4.54 μm |
| $C_2H_2$<br>2.99÷3.09 μm | $HOCl$<br>2.6÷2.9 μm | $HCl$<br>3.33÷3.7 μm | $NH_3$<br>2.27; 2.94 μm |
| $C_2H_4$<br>3.1÷3.4 μm | $HBr$<br>3.7÷4.0 μm | $OH$<br>2.38÷2.63 μm | $NO+$<br>4.08÷4.44 μm |
| $C_2H_6$<br>3.3 μm | $HI$<br>2.27÷2.3 μm | $H_2CO$<br>3.38÷3.7 μm | $HNO_3$<br>5.74÷5.98 μm |
| $CH_3Cl$<br>3.22÷3.38 μm | $H_2S$<br>3.7÷4.4 μm;<br>2.5÷2.8 μm | $CO$<br>2.24 μm;<br>4.4÷4.8 μm | $NO_2$<br>3.4 μm |
| $OCS$<br>3.45; 4.87 μm | $HCN$<br>2.94÷3.1 μm | $HO_2$<br>2.73÷3.1 μm | $SO_2$<br>4.0 μm |
| $C_6H_6$<br>2.44÷2.47 μm;<br>3.17÷3.33 μm | $CHBr_3$<br>2.39 μm;<br>3.29 μm | $C_2H_4Cl_2$<br>3.23÷3.51 μm | $C_2H_2Cl_2$<br>2.50÷2.86 μm |
| $C_2HCl_3$<br>3.22÷3.25 μm;<br>4.20÷4.35 μm | $H_2O_2$<br>3.70÷3.85 μm;<br>4.17÷4.35 μm | $HF$<br>2.33÷2.78 μm;<br>4.17÷4.43 μm | $C_3H_8$<br>3.28÷3.57 μm |