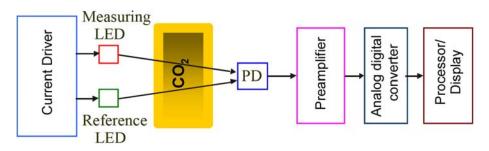# Mid-IR Products

Application in Gas Sensors

Principle of Infrared Optical Absorption Analysis

Infrared optical analysis is based on the vibrations of the atoms of a molecule. Infrared radiation passes through a sample and the fraction of the incident radiation that is absorbed at a particular energy is determined. The energy at which any change in the absorption occurs corresponds to the frequency of a vibration of a molecule that is analyzed.

Principle scheme for chemical agents sensing based on LED-PD optopair is quite simple. Measuring LED emits radiation at wavelength corresponding to maximum absorption of the analyte. Reference LED emits at wavelength that corresponds to the absence of absorption of the analyte. Signal difference between measuring LED that is partially absorbed in optical cell and the reference LED is proportional to the concentration of the analyte.

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:

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