1. Publishable summary

The project SensHy focuses on a new class of tunable mid infrared (MIR) laser sources with performance presently unattainable and the development of novel photonic gas sensors based on tunable diode laser spectroscopy (TDLS) using these novel sources.

Important technical objectives in the last period of the project concerned a further optimization of GaSb based active material and laser devices especially for emission in a target wavelength range around 3.35 µm. Monomode laser devices as specifically required for the respective sensor environment have been successfully fabricated and provided to the application partners, including monomode DFB devices with emission wavelength around 3.355 µm under cw operation, as well as widely tunable devices covering two emission windows around 3.330 µm / 3.355 µm under cw operation.
Two different kinds of structures were investigated within SensHy: Type I quantum well structures using quinary barrier material (work package WP1) and type II interband cascade laser structures (work package WP2). Competitive laser performance figures were achieved based on both material systems covering the entire SensHy wavelength range of interest 3.0 – 3.5 µm.
Type I quantum well structures allowed to reach momomode device operation up to around 3.4µm with record device performance defining the current state-of-the-art in this material system. Type II interband cascade laser structures proved especially beneficial to further extend the emission wavelength beyond 3.4µm with corresponding monomode devices under cw at room temperature operation being also fabricated.

Work package WP3 is related to the development of photonic sensor systems based on tunable diode laser spectroscopy (TDLS) using the novel MIR laser sources.
A system for sensing of hydrocarbons in industrial environments was successfully realized. Here, the SensHy project focused on two particular important applications, namely the detection of acetylene impurities in ethylene and propane impurities in propylene taking advantage of the real time measurement capability of TDLS. Ethylene is the largest volume industrially produced organic material and propylene is the world's second largest petrochemical commodity.
In addition, also a portable gas detection system for application in the gas distribution market with the possibility to differentiate between Methane, Ethane and Propane has been successfully developed in the last period of the project.

In parallel to these technical activities, also work concerning the future use and exploitation of the SensHy results including IPR and market studies, project dissemination including the preparation for the workshop MIRSENS organized by the SensHy consortium and project management has been performed in the corresponding work packages WP4 and WP5.