

## **Optical probing and control of heat propagation at the nanoscale**

In this project we intend to demonstrate, in collaboration with scientists from the Ludwig-Maximilian University in Munich, that it is possible to control heat propagation in a silver nanowire. Since In the case of nanostructures it is not possible to use any standard thermometer to measure their temperature, we put forward a solution, which involves nanocrystals doped with rare-earth-ions. The emission of these nanocrystals strongly depends on the temperature, thus we expect them to be perfectly suitable for monitoring the temperature in the vicinity of a silver nanowire with a spatial resolution of 50 nm.

The first approach assumes fabrication of a relatively simple hybrid nanostructure, where a nanowire will be surrounded by single nanocrystals, each of which can be considered an individual thermometer. Imaging of the emission of these nanocrystals should allow for direct description of how heat is dissipated to the surroundings along the nanowire.

The second approach is based on using a single nanocrystal attached to a tiny needle. The needle, while moving along a nanowire will provide a way of using the nanocrystals as a mobile thermometer.

We anticipate that the results obtained using these two approaches will converge, and furthermore that they allow to understand the mechanisms responsible for heat propagation and dissipation in nanostructures, which is of vital importance for constructing future optical and electronic systems.