Secondary Ion Mass Spectrometer (SIMS)

In 2014, the *Laboratory for Surface Science* acquired a SIMS spectrometer from Hiden Analytical (United Kingdom) as part of the project *Development of Research Infrastructure on the Campus of the University of Rijeka* (RISK), which was funded by the European Union from the European Regional Development Fund and the Republic of Croatia. Secondary ion mass spectrometry (SIMS) is an analytical technique for elemental analysis and measurement of ultra-low concentrations of impurities and dopants in various materials and thin films, which is used in particular in semiconductor physics and technology. The detection limits for most elements are in the ppm or even ppb range, making SIMS one of the most sensitive techniques for elemental analysis.

SIMS is based on the detection of ions (secondary ions) that are ejected from the surface of the sample when bombarded with energetic ions (primary ions). The primary ions erode the surface (a process known as sputtering) and a small percentage of the ejected atoms or molecules are ionized (secondary ions). As a source of primary ions, our device uses Cs^+, O_2^+ or Ar^+ ions and can detect positive or negative secondary ions (atoms and molecules) in the range of 1 amu to 500 amu using a quadrupole mass analyzer.

In static mode SIMS is used to analyze elements directly on the surface of the samples, while in dynamic mode SIMS uses surface erosion (creation of craters on the surface) for detailed profiling of elements. Our instrument is also capable of detecting neutral atoms and molecules through the SNMS (Sputtered Neutral Mass Spectroscopy) mode of operation. Neutral atoms that are ejected from the sample surface during ion bombardment before entering the quadrupole are ionized by an electron source.