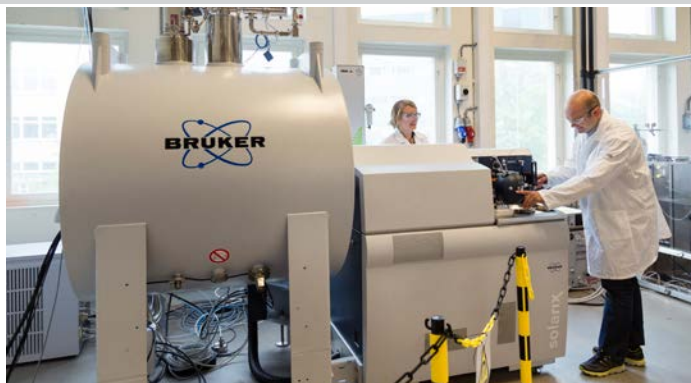
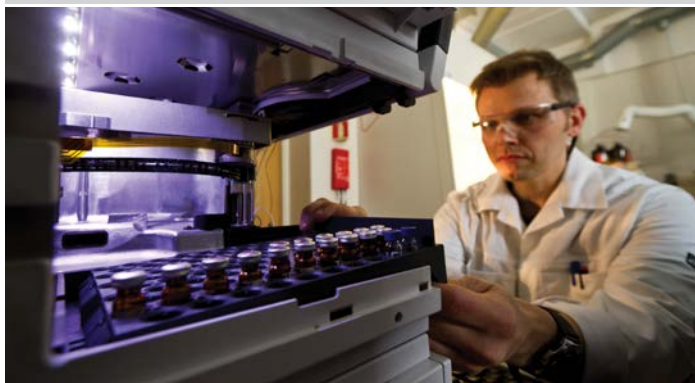


Analytical and screening facilities

June 2015



Analytical and screening facilities

Mass spectrometry (MS) is a universal principle for detection of compounds based on molecular weight and structure, and makes it possible to *identify and quantify* compounds with a high degree of certainty and very high sensitivity. MS has therefore become the “gold standard” within several fields of analytical chemistry, from biological research to forensic, elemental and organic analyses

The MS laboratory

The MS laboratory at SINTEF / NTNU represents state-of-the-art of mass spectrometric instrumentation and includes online gas (GC-MS) and liquid (LC-MS) chromatographic separation. GC-MS is ideally suited for a wide range of volatile and semi-volatile compounds that can be identified on the basis of their unique mass spectra. For larger and more complex compounds, like metabolites, proteins or polymers, LC-MS is ideally suited and is used complementary to GC-MS. For very large analytes like polymers and nanoparticles, field flow fractionation (FFF) is used.

The laboratory comprises both low-resolution mass spectrometers (optimized for sensitivity and quantitative analyses) and high-resolution instruments for elucidation of molecular structures. MS generally offers a very high analytical sensitivity that enables detection of extremely low concentrations (nanomolar/ppt levels), in combination with high specificity (ensuring confidence in identification). An ultrahigh-resolution high-field-strength FTICR-MS instrument



Automated picking of colonies in the high-throughput screening laboratory

was installed mid-2013, providing an internationally unique capacity for analysis of extremely complex and challenging systems, including oil, proteome and metabolome samples. This instrument is also equipped and used for MS imaging, i.e. direct, simultaneous and label-free chemical visualization of compound distribution, e.g. in biological tissue cross sections, with a lateral resolution down to approx. 20 μm .

Our instrument platform is:

- 4 GC-MS
- 5 LC-MS (single quadrupole)
- 10 LC-QQQ (triple quadrupole)
- 2 LC-QTOF
- 1 Nano-LC / ChipCube system
- 1 high-field-strength FTICR-MS
- 1 FFF (field flow fractionation, with flow, centrifugal and thermal separation units)
- 1 ICP-QQQ-MS (triple quadrupole plasma MS)
- 1 Agilent Rapidfire high throughput MS instrument

The above analytical platform is very versatile and enables us to work in a wide range of research fields, currently including e.g. chemical process development, oil and petrochemicals, water analysis, bioprospecting and bioeconomy, food, metabolomics and proteins, polymers, natural and manufactured nanomaterials, and pathology and disease in the clinic.

The facility is also equipped for mass based analytical and preparative fraction collection. The preparative system facilitates isolation and purification of sufficient sample material (mg to g quantity) for e.g. NMR analysis or extended bioactivity testing.

High throughput screening

The robotic screening facilities at SINTEF perform robotic liquid handling, colony picking and other operations necessary for high throughput screening, such as high capacity centrifugation and tightly controlled incubations.

Robotic liquid handling

Our three liquid handling workstations are equipped for washing, filling, shaking, filtration, solid phase extraction, incubation, cultivation (including fed-batch), ELISA, and optical readout (spectrophotometric, luminometric or fluorometric) of microtiterplates. Robotic arms move consumables and microtiterplates within the workstations, including storage units (total capacity approx. 180 microtiterplates) and a shaking incubators (total capacity 12 microtiterplates, 42 in static mode). The robotic workstations are equipped with pipetting tools for fast and accurate pipetting in microtiterplates (volume range 1 – 1000 µl), as well as for pipetting in tubes, trays and troughs, and can use disposable or fixed pipet tips.



Efficiency and accuracy are the two main reasons for robotizing liquid handling. The robot can easily perform 30.000 pipetting cycles (aspiration, dispensing and mixing) in 8 hours. Robotized liquid handling is also highly accurate and eliminates human error in large, complex pipetting workflows. The 384-channel pipetting introduces an error of less than 2% at 1 µl working volume.

Experience and available assays

SINTEF has significant experience in development of HTS protocols and lab automation. The HTS facility is used in a range of applications including strain development, enzyme evolution, sample preparation and automation of in-vitro assays. A range of assays are fully automated using traditional spectroscopic readouts. SINTEF has, however, also significant experience in HTS using the Agilent Rapidfire technology for ultra-fast and highly specific detection of analytes using mass spectroscopy. This technology allows detection of multiple analytes in complex samples with analysis times of approximately 10-15 seconds per sample.

SINTEF has established in-vitro assays for evaluation of cytotoxic, antifungal and antibacterial activity of extracts, compounds and/or nanoparticles. Assays based on a range of cell lines are established. SINTEF has also established reporter assays for sub-lethal cellular stress/tox responses (oxidative stress, DNA damage, NF-kB; hypoxia, ER Stress, heavy metal stress, heat shock, glucocorticoid, JNK, xenobiotic). Antifungal and antibacterial activity is analysed in in-vitro assays based on detection of inhibition growth of a panel of selected indicator organisms including microorganisms with known resistance to relevant antibiotics.



SINTEF Materials and Chemistry
box 4760 Sluppen, NO-7465 Trondheim, Norway
Phone: + 47 40 00 37 30, www.sintef.no/materials_chem

CONTACT

Geir Klinkenberg (screening)
Phone: + 47 92 48 14 02
Geir.Klinkenberg@sintef.no

Kolbjørn Zahlisen (analyses)
Phone: + 47 986 93 199
Kolbjorn.Zahlisen@sintef.no