

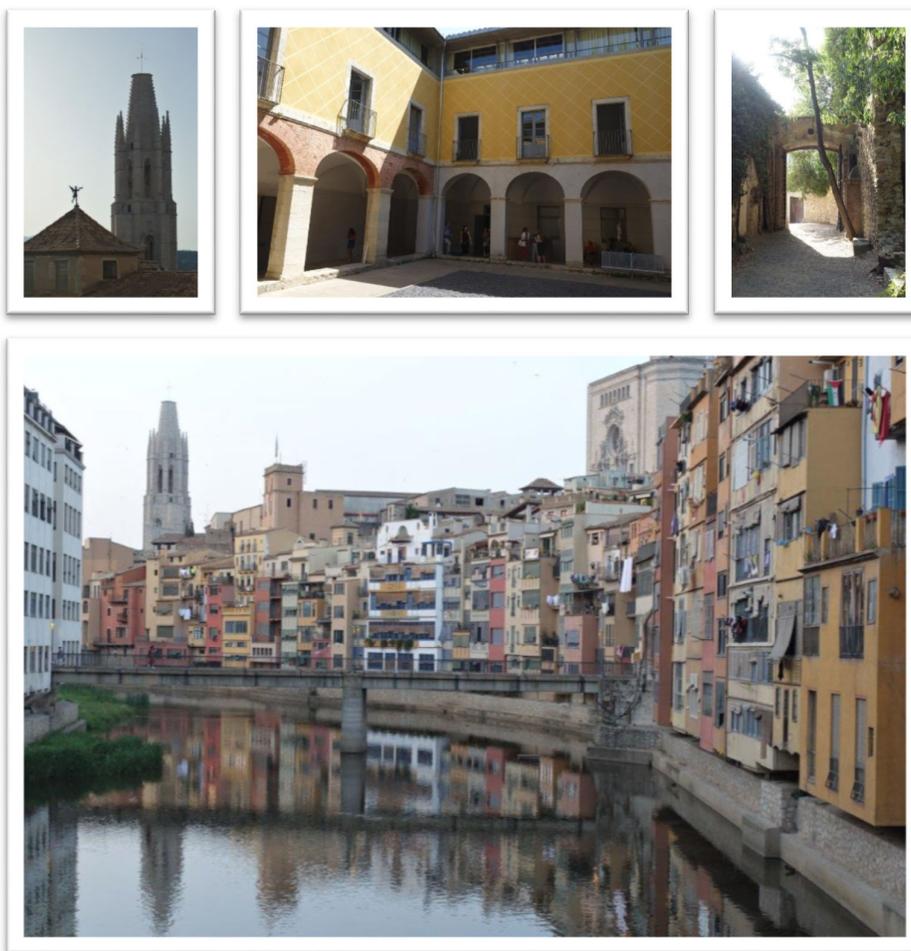


A hilltop view of Girona, Spain

18th International Conference on Total Reflection X-ray Fluorescence Analysis and Related Methods (TXRF2019) and Workshop

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Total Reflection X-ray Fluorescence (TXRF) spectrometry is a surface analysis method using the X-ray grazing incident angle. This technique has been accepted for ultra-trace elemental analysis on silicon wafers in the semiconductor industry for a couple of decades and has recently seen use for environmental water, food, and biological analysis in numerous fields. The International Conference on TXRF has been held every two years since 1986, and the 18th conference took place on June 25-28 in Girona, Spain. Girona is a beautiful historical city located in the north east of Catalonia that has existed since pre-Roman times. The river Onyer flows through the center of the city, lined by picturesque houses. The conference venue, Centre Cultural la Mercè, is located in the old town, which wraps around the hill to the east of the river. The building itself is an old convent from the 14th century.



Clockwise from top left: Church of St. Felix; The Centre Cultural la Mercè, the venue of the conference; a historical spot in Girona; Houses along the Onyer River

The TXRF 2019 conference brought 72 participants from 21 countries. Dozens of research reports on TXRF, grazing incident X-ray fluorescence (GIXRF), and other types of X-ray analysis were presented by experts. There were presentations on benchtop TXRF spectrometer applications in geological powders and biological tissues, and their sample preparation techniques were discussed. Analysis of aerosol particles on filters with GIXRF and reference-free thin film characterization with GIXRF and X-ray reflectivity (XRR) were

also recent topics of note. The author of this report gave a presentation on waste water analysis using the benchtop TXRF spectrometer, NANO HUNTER II. In TXRF, a water sample is mixed with an internal standard and pipetted onto a reflector carrier. Then the dried residue of the micro droplet is measured. Since high matrix liquids such as waste waters leave thick residues, the absorption and shape effects cannot be neglected in the analysis result evaluation. Factors contributing to unreliability in the analysis results were investigated.

Together with oral and poster presentation sessions, Rigaku added demo sessions to the TXRF conference program for the first time. We held a workshop on our TXRF products and 38 attendees gathered in a lecture room in the afternoon of the first day of the conference. Rigaku has been a leading company in wafer surface contamination metrology with TXRF in the semiconductor field. The TXRF V-310 advanced model comes loaded with novel functionality, including sweeping measurement of a whole wafer, the measurement of wafer backsides, and an automatic TXRF-VPD (vapor phase decomposition) system that increases sensitivity by concentrating contamination on wafer surfaces and bevels.



Demo session at a lecture room (left) and oral presentation (right)

Rigaku has offered a general purpose benchtop TXRF spectrometer, NANO HUNTER II, since 2015. The primary subject of the workshop was introducing the NANO HUNTER II to attendees. The optics of NANO HUNTER II are uniquely designed with a curved multilayer mirror and a variable slit. Because the curved multilayer mirror is composed of two levels of d values, the instrument can offer two excitation sources, Mo- $K\alpha$ (17.4 keV) and high energy (30-35 keV), from one X-ray tube to cover a wide analysis range. Further, owing to the convergent beam from the curved mirror, simply driving the slit behind the mirror can adjust the glancing angle of the X-ray beam, providing fast and stable measurement.

After a detailed explanation of the design concepts behind the NANO HUNTER II, we performed a demo of NANO HUNTER II using the software and videos. We showed how to set up and run quantification applications with the internal standard and calibration curve methods, what kind of data we obtain from actual wafer samples, and how to process data. Angle scan measurements were also demonstrated with a double layer thin film. Speakers and attendees had good discussions on the improved sensitivity compared to the first generation NANO HUNTER, sample preparations, impurity of analysis, and more.

The 90 minute workshop was a great opportunity to introduce Rigaku's lineup of TXRF products. We would like to thank all attendees, with special mention given to Eva Marguï and Manuela Hidalgo, University of Girona, and Ignasi Queralt, IDAEA-CSIC, Barcelona, who organized the conference and the workshop and kindly gave us their support.



Memorial photo after demo session of Satoshi Ikeda, Asier Vargas (Paralab), Hikari Takahara, and Ignasi Queralt (IDAEA-CSIC, organizer of the event)