Introduction to the TCD lab facilities

Dr. Hilde Koch

10th December 2021
Different protocols for different labs

- Fission Track Lab
- Heavy Liquid Lab
- Magnetic Separator
- Unit 36b (Jaw Crusher, TEMA, Anvil)

| • LA-ICP-MS Lab (Geochronology) |
| • SEM |
| • LA-ICP-MS Lab (Sulphides) |
| • Clean Lab |
Museum Building
Fission Track Lab, Heavy Liquid Lab and Magnetic Separator

PI – Fission Track Lab and Heavy Liquid Lab - Prof David Chew (chewd@tcd.ie)
PI – Magnetic Separator – Dr. Quentin Crowley (crowleyq@tcd.ie)
Dedicated Postdoc - Dr. Hilde Koch (hilde.anna@ucd.ie)

Contact
• Email PI, cc Hilde

Equipment
• Frantz LB-1 magnetic separator
• Mineral Separation
  • Diiodomethane or Methylene Iodide (MI)
  • Sodium-polytungstate
• Picking of mineral grains using a Nikon SMZ 1500 binocular
• Preparation of epoxy resin discs
• Semi-automatic polisher for pucks using a diamond grit first (c. 10 μm), followed by 6 μm and 1 μm polishing paste
Fission Track Lab, Heavy Liquid Lab and Magnetic Separator

Training

• Responsibility of respective PI
  • Often devolved to competent and experienced postdocs or senior postgrads

Access

• Google calendar
  • Once training is completed, the user gets a unique access link for bookings – does not apply to undergrads
  • Same lab can only be booked for two days per week → sustains a fair usage of labs
    • If lab is not busy and there is no booking for the following day, you can book labs more than twice a week
• Frequent users get a key for respective lab
• Use provided sign-in sheet
TTEC
(Trinity Technology and Enterprise Campus)
—
Grand Canal Dock
Unit 36b

Robbie Goodhue
Dedicated Postdoc (Dr. Hilde Koch; hilde.anna@ucd.ie)

Contact
• Either Robbie or myself

Equipment
• Jaw crusher (tungsten carbide)
• Disc mill / TEMA (tungsten carbide and agate)
• Anvil and Hammer
• Sieves
• Pan
• Oven
Ball mill and shaking table are currently broken
Training

- Responsibility of your PI
  - Often devolved to experienced postdocs or senior postgrads

Access

- Google calendar
  - Once training is completed, the user gets a unique access link – does not apply to undergrads
- Same lab can only be booked for two days per week → sustains a fair usage of labs
  - If lab is not busy and there is no booking for the following day, you can book labs more than twice a week
- Use provided log-book
- Key is with Sarah Carty (sacarty@tcd.ie) and Clara Siqueira (decastrc@tcd.ie) in the ESRL (Unit 6)
  - When signing in the google calendar, check first if either of them are there
- Working hours are between 9 am to 5 pm
Consumables

- Are provided
- Charged every 3 months based on the calendar booking

<table>
<thead>
<tr>
<th>Task</th>
<th>Consumables</th>
<th>Daily rate (10.12.21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picking</td>
<td>alcohol, wipes, tweezer; (having own tweezer is recommended)</td>
<td>5 €</td>
</tr>
<tr>
<td>Mounting</td>
<td>Resin, hardener</td>
<td>5 €</td>
</tr>
<tr>
<td>Polishing</td>
<td>polishing fluid, polishing plates, alcohol, wipes, gloves</td>
<td>20 €</td>
</tr>
<tr>
<td>Magnetic Separator</td>
<td>Sample bags</td>
<td>3 €</td>
</tr>
<tr>
<td>Mineral Separation</td>
<td>alcohol, acetone, wipes, gloves, heavy liquid, glassware</td>
<td>20 €</td>
</tr>
<tr>
<td>Jaw Crusher</td>
<td>alcohol, wipes, sample bags</td>
<td>5 €</td>
</tr>
<tr>
<td>TEMA</td>
<td>alcohol, wipes, sample bags</td>
<td>5 €</td>
</tr>
<tr>
<td>Ball Mill</td>
<td>alcohol, wipes, sample bags</td>
<td>5 €</td>
</tr>
<tr>
<td>Hammer &amp; Anvil</td>
<td>alcohol, wipes, sample bags</td>
<td>5 €</td>
</tr>
</tbody>
</table>
Common Lab Practice

• Book yourself into google calendar
• Use provided sign-in sheet
• Wipe surface after you have completed your work
• Return consumables to dedicated place
• Get new consumables from technicians BEFORE you empty it
• Bring back materials that can be reused, e.g. glass plates, ...
• Report broken equipment IMMEDIATELY to PI of equipment and to me
Clean Lab / Solution ICP-MS

Lab Manager (Prof David Chew, chewd@tcd.ie)
Dedicated Staff: Cora McKenna; mckennca6@tcd.ie

Contact
• Email Dave, cc Cora

Costs
• REE and selected trace elements of silicates
  • 120€ / sample for HF-HNO₃ digestion on hotplate
  • 200€ / sample for high pressure/bomb digestion
• REE and selected trace elements of carbonates
  • 80€ / sample for HNO₃ leachates
• Selected trace elements of fresh water samples
  • 80€ / sample
Solution ICP-MS

Good to know

• One batch includes 20 unknown samples (+ standards and blanks)
• Analysis of one sample batch can take between 2 to 3 months
• Materials not to be analysed
  • sulphides
  • Synthetically made samples, e.g. where trace elements are in major concentrations
  • Samples prepared with tungsten carbide (agate milling only!)
  • Sea water / samples with high salt content

Thermo Fisher Scientific, iCAP-Qc Quadrupole Mass Spectrometer
LA-ICP-MS Lab (Sulphide Samples)

Teledyne Technologies Photon Machines G2-193nm Excimer Argon-Fluorine Laser
Thermo Fisher Scientific, iCAP-Qc Quadrupole Mass Spectrometer

Lab Manager - Dr. Sean Mc Clenaghan (mccclus@tcd.ie)
Manager for iCRAG work - Dr. Emma Tomlinson (tomlinsone@tcd.ie)
Dedicated Postdoc - Dr. Maurice Brodbeck (brodbecm@tcd.ie)

Contact
• Email respective Lab manager, cc Maurice

Costs
• iCRAG: 350 € / day
• Others: 450 € / day
LA-ICP-MS Lab (Sulphide Samples)

**Preparation**
- Scanned thin sections or SEM images with location or area of interest indicated on the image
- Knowledge of major element composition of phase of interest for internal standardization

**Analyses**
- 150 spot analyses
- 2-3 maps per day, depending on size and parameters (takes approximately 1h to map 1mm²)
Solution Optical Emission Spectroscopy - OES

Lab Manager - Dr. Emma Tomlinson (tomlinsone@tcd.ie)

Costs
- 4€ / sample
- Minimum amount charged: 100€ / day

Analyses
- Maximum 80 samples / day
iCRAG Lab / CMA

Virtual lab tour available on:
https://www.tcd.ie/Geology/cma/index.php
LA-ICP-MS Geochronology

Teledyne Technologies Photon Machines G2-193nm Excimer Argon-Fluorine Laser
Agilent 7900 Mass Spectrometer

Lab Manager: Prof David Chew (chewd@tcd.ie)

Dedicated Staff: Foteini Drakou (drakouf@tcd.ie)

Contact

• Email Dave

Costs

• iCRAG: 350 € / day
• Others: 450 € / day

Preparation

• Scanned puck with location of grains or area of interest indicated on image

Analyses

• 300 spot analyses
Tescan Tiger MIRA3 FEG-SEM

Contact
Dr. Paul Guyett (pguyett@tcd.ie)

Cost
• €320 per day
• PI’s can purchase Gold, Silver or Bronze memberships for multiple day access.

Detectors and Features
• Motorised backscatter electron detector
• Colour cathodoluminescence detector
• Two Oxford Instruments X-Max 150 mm² detectors
• Oxford AZtec capable of spot analysis, EDX mapping and Feature analysis.
• WITec RISE Raman system
Tescan S8000 FEG-SEM

Contact
Dr. Paul Guyett (pguyett@tcd.ie)

Cost
• €320 per day
• PI’s can purchase Gold, Silver or Bronze memberships for multiple day access.

Detectors and Features
• Motorised backscatter electron detector
• Colour cathodoluminescence detector
• Four Oxford Instruments X-Max 170 mm² detectors
• Oxford AZtec capable of Aztec Live, spot analysis, EDX mapping and Feature analysis
• Oxford Instruments Symmetry EBSD detector (Currently not available for use)
Sample Preparation

- Non-conductive samples need to be coated before SEM analysis.
- Gold coating for samples that need super clear imaging. Cost is €30 per sample.
- Carbon coating for EDX analysis. Cost is currently free.
- Samples include
  - flat polished thin sections (no more than 2.7cm wide and 7.5cm long)
  - or polished resin mounts no more than 2.5 cm in diameter.
Profilm 3D
White Light Interferometry

Contact
Leona O’Connor (mulveyle@tcd.ie)

Cost
• €80 per hour
Nikon Optical Microscope

Contact
Dr. Paul Guyett (pguyett@tcd.ie)

Cost
• Currently free

Features
• Two Nikon Optical Microscopes both fitted with NIKON DS-Ri2 cameras.
• Fully automated motorized stage allowing for large stitched images.
• Fully automated motorized z-stacking allowing imaging of samples with varying height.
Thanks for your Attention!