Characterization of MXenes (one-day course)

Lead Instructor: **Dr. Mike Shekhirev**
Organizer: **Prof. Yury Gogotsi**

In this course we will cover characterization of MXene powders, colloidal suspensions, single flakes and films by various methods. At the end of the course you will learn how to (i) correctly identify a set of techniques to solve your characterization problem, (ii) properly apply these techniques to avoid measurement artifacts and (iii) analyze and interpret the results. If you need to determine the success of your synthesis procedure, assess quality of MXene or simply determine material structure/properties, such as interlayer spacing, flake size or stoichiometry – this course is for you.

- Characterization of MXenes (Lectures)
    - Application of characterization techniques to MXenes
        - X-Ray diffraction
        - Raman spectroscopy
        - XPS spectroscopy
        - Electron and scanning probe microscopy
        - Particle size analysis
        - Optical characterization
    - Challenges in characterization of MXenes and comparison to other nanomaterials
- Lab demonstrations of characterization on Ti_3AlC_2-based MXenes and demonstration of operation of instruments (groups of five)
        - X-Ray diffraction analysis of powders and films
        - Raman spectroscopy (selection of wavelength and laser power)
        - XPS spectroscopy (sample preparation and spectra deconvolution)
        - Scanning electron microscopy analysis of particle morphology and size
        - UV-vis spectroscopy analysis of optical properties and MXene quality
        - Particle size analysis and zeta-potential
- Interactive Question and Answer Session (Bring your data/problems!)