AMAS and AMMS Technical Workshop at UWS

On December, 2014, a joint technical workshop was held between AMAS, AMMS and Materials Australia on “Thermal Characterisation” at the University of Western Sydney.

This event was supported by Netzsch Australia, AMMS, AMAS and Materials Australia and had over 40 people book in. The workshop was free of charge for anyone who is a member of one of the respective societies. It was great see so many new memberships submitted before the course.

The workshop ran for a full day and was an excellent opportunity for users of Thermal Analysis instrumentation to learn about new technologies and applications. The seminars and workshop were conducted by a number of NETZSCH local and international Thermal Analysis Specialists. The physical and chemical properties of any material change under the influence of temperature. Such changes can be systematically analysed for almost any sample by applying specified variations in temperature, atmosphere and pressure.

The workshop focussed on differential scanning calorimetry (DSC), thermal gravimetric analysis (TGA) and coupling techniques such as DSC/TG coupled with FTIR-GCMS-QMS” and “DSC/TG techniques and application”. The program included:

1. Introduction to main methods of Thermal Analysis
2. Principle of DSC and TGA
3. DSC/TG Techniques and Applications
4. Principles of FT-IR (Fourier-Transform Infrared Spectrometer)
5. Coupling Techniques (TG/STA – FTIR/QMS/GCMS)
6. Factors influencing DSC results
7. Temperature modulated DSC (TM-DSC)
8. Post processing the data collected and some Thermal Analysis training
9. Polymeric, ceramic and other materials applications
10. Nuclear and Thermoelectric Applications

Typical Information that can be determined from DSC Measurements is the:

- Characteristic temperatures (melting, crystallisation, polymorphous transitions, reactions, glass transition)
- Melting, crystallisation, transformation and reaction heats (enthalpies)
- Crystallinity of semi-crystalline substances
- Decomposition, thermal stability
- Oxidative stability
- Degree of curing in resins and adhesives.
- Eutectic purity
- Specific heat (Cp)
- Compatibility between components
- Influence of aging
- Distribution of the molecular weight
- Impact of additives, softeners or admixtures of re-granulates

Typical Information that can be determined from TGA Measurements is the:

- Mass changes
- Temperature stability
- Oxidation/reduction behaviour
- Decomposition
- Corrosion studies
- Compositional analysis
- Thermo-kinetics

The subsequent coupling of the TGA/DSC system with a FTIR allows for areas of application such as determining:

- composition of materials
- solid-gas reactions
- determining combustion products
- residual solvent content
- precursor reactions
- evaporation
- outgassing

As you can see from the above information, Thermal Characterisation of materials is very powerful and there is a lot that can be learnt. I would like to thank NETZSCH Australia, in particular Jiunn Jieh Lee (JJ), Andrew Gillen and Liang Xu for sponsoring such an informative workshop. More importantly, I would like to thank our speakers, in particular Dr Liang Xu for his excellent presentations and for taking time to speak with many from the audience. Many people stayed after the meeting to have a drink with the speakers to discuss the many applications covered.

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