

# Microwave Chemistry Short Course

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NAWI Graz – The collaboration of the University of Graz and the Graz University of Technology, Austria.

## First Afternoon

<b>13:30-15:00</b>  <i>1. Introduction - Background</i> Why microwave-assisted chemistry - From defrosting foodstuff to chemical and industrial applications. <i>2. General References</i> Books - review articles - feature articles. <i>3. Microwave Theory</i> The electromagnetic spectrum - microwave dielectric heating mechanisms - dielectric properties - penetration depth - material-wave interactions - loss tangents - solvents. <i>4. Equipment Review</i> Multimode vs. monomode cavities - commercially available microwave reactors - general features - instrument market survey.	<b>15:30-17:00</b>  <i>5. Microwave Effects</i> Temperature measurements under microwave irradiation - how does microwave heating accelerate reactions - definitions of microwave effects - do special microwave effects exist and how to take advantage of them - heating while cooling - pulsed irradiation. <i>6. General Processing Techniques</i> Solvent-free protocols - phase transfer catalysis - open versus closed vessels - pre-pressurized reaction vessels - chemistry in ionic liquids and hot water - passive heating elements.
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## Second Afternoon

<b>13:30-15:00</b>  <i>7. Microwaves in Polymer Chemistry</i> Radical polymerizations - Ionic polymerizations - Controlled and living polymerization techniques - Benefits of microwave assistance compared to conventional heating - Impact for academic research and industrial production.  <i>8. HTS Processing Techniques</i> Parallel vs. automated sequential processing - supported reagents and solid-phase synthesis - time savings with microwaves.	<b>15:30-17:00</b>  <i>9. Scale-up Technology</i> Scale-up in batch, continuous flow or stop flow mode - the numbering up approach - scale-up equipment - production scale - microreactor and microcapillary approaches.  <i>10. Practical Tips and Safety Aspects</i> Advantages of MW chemistry - why MW chemistry can fail - relating oil bath to microwave chemistry - reaction optimization - general tips - ACS publication guidelines - reaction databases - safety: the do's and don'ts in microwave chemistry.
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