

Code: <b>QO851</b>								
Name: <b>Aplicação de Tecnologias em Química Orgânica Sintética</b>								
Name in English: <b>Application of Enabling Technologies in Synthetic Organic Chemistry</b>								
Name in Spanish: <b>Aplicación de Tecnologías en Química Orgánica Sintética</b>								
Subject type: Weekly								
Approval Type: Grade and Frequency								
Characteristic: Regular								
Frequency: 75%								
Period Type / Offering period: Semester / At the discretion of the Teaching Unit								
Requires Final Exam: Yes								
Vectors								
T	L	P	O	PE	OE	SL	WEEKS	CREDITS
2	-	-	-	-	-	2	15	2
Occurrence on curriculum:								
Pre requirement: QO321 + *QO521								
<b>Summary:</b> Introduction. Green chemistry. Sonochemistry. Microwave Irradiation. Continuous Flow Chemistry. Mechanochemistry.								
<b>Program:</b>								
1. Introduction								
- Importance of new technologies for synthetic organic chemistry								
- New technologies and green chemistry								
- Laboratory of the future								
2. Sonochemistry								
- Theoretical Aspects of Ultrasound								
- Ultrasound in synthetic organic chemistry								
3. Microwave Irradiation								
- Theory of microwave irradiation and heating mechanisms								
- How does microwave irradiation accelerate chemical reactions?								
- Microwave effect versus thermal effect								
- Importance of solvents								
- Microwave-assisted organic synthesis								
- Microwave and the basics of green chemistry								
4. Continuous Flow Chemistry								
- Fundamentals of continuous flow chemistry.								
- Principles of flow control: importance of mixing and heating.								
- Types of reactors: spiral, chip and fixed bed. Equipment, devices and engineering aspects.								
- Multi-stage and multi-step flow reactions								
- Photochemical electrochemical flow reactions								
- Flash Chemistry								
- Increased scale, on-line analysis and process safety								
5. Mechanochemistry								
- Fundamentals of mechanochemistry and types of mills								
- Solvent-free reactions in solid phase								
- Solvent-assisted mechanochemistry								
- Applications of mechanochemistry in organic synthesis								
<b>Basic Bibliography</b>								
1) MASON, T. J.; PETERS, D. Practical Sonochemistry: Power Ultrasound Uses and Applications. 2. Ed. Cambridge: Woodhead Publishing, 2002. 166 p.								

- 2) TIERNEY, J.P.; LIDSTROM, P. Microwave Assisted Organic Synthesis. 1. Ed. Oxford: Wiley-Blackwell, 2009. 296 p.
- 3) DARVAS, F.; DORMÁN, G.; HESSEL, V.; LEY, S.V. Flow Chemistry – Fundamentals, Volume 1. 2. Ed. Berlin, Boston: De Gruyter, 2021. p.

#### **Supplementary Bibliography**

- 1) DARVAS, F.; DORMÁN, G.; HESSEL, V.; LEY, S.V. Flow Chemistry – Applications, Volume 2. 2. Ed. Berlin, Boston: De Gruyter, 2021. 640 p.
- 2) TODRES, Z. V. Organic Mechanochemistry and Its Practical Applications. 1. Ed. Londres: CRC Press, 2006. 170 p.
- 3) WIRTH, T. Microreactors in Organic Chemistry and Catalysis. 2. Ed. Londres: Wiley-VCH, 2013. 812 p.
- 4) COLACINO, E.; ENNAS, G.; HALASZ, I.; PORCHEDDU, A.; SCANO, A. Mechanochemistry: A Practical Introduction from Soft to Hard Materials. 1. Ed. Berlin, Boston: De Gruyter, 2020. 114 p.
- 5) MASON, T.J.; LORIMER, J.P. Sonochemistry - theory, applications and uses of ultrasound in chemistry. 1. Ed. Nova Iorque: Wiley-Interscience, 1989. 252 p.