Chim/06 Industrial Organic Chemistry

Academic year: 2016/2017
Faculty: Dipartimento di Chimica
Study courses: Chemistry (2nd level)
Study plans/Curricula:
Type:
Total Credits: 4
Didactic Methods: lessons
Didactic Period: First year, first semester
Exam type: oral
Professor in charge: Francesco Babudri

Training objectives
Knowledge of principal processes of organic industrial chemistry.

Prerequisites
Basic concepts of organic chemistry

Didactic Methods
lectures

Course programme

Introduction to industrial organic chemistry:
Fossil fuels: coal, petroleum and natural gas origin, composition and transformations.

Chemical intermediates with a single carbon atom
Syngas production and uses. Fischer-Tropsch process. Synthesis of methanol, formaldehyde, formic acid. Methylamines from methanol. Methyl halides.

Gaseous olefins
Catalytic and thermal cracking. Production of butadiene, ethylene, propylene and butenes.

Olefins >C5
Linear alfa olefins (alfen process). Other linear olefins. Branched olefins. Metathesis process of olefins (SHOP Process)

Dienes

Industrial synthesis of isoprene and chloroprene.

Processes involving carbon monoxide:
Hydroformylation of olefins. Carbonylation of olefins. Koch process.

Oxidation products of ethylene
Ethylene oxide and derivatives. Acetaldehyde (Wacker-Hoechst process). Acetic acid and acetic anhydride. Ethyl acetate. Pyridines. Vinyl chloride and vinyl acetate.

Oxidation products of propylene:
Propylene oxide and derivatives. Acetone. Methylmetacrylate from acetone and from isobutene. Other acrylic derivatives: acrolein, acrylic acid, acrylonitrile.

Monomers for polyamides:
Adipic acid from KA mixture and from carbonylation of butadiene. Hexamethylenediamine from adipic acid and by hydrocyanation of butadiene. EDH process of acrylonitrile. Decanedioic and dodecanedioic acids. 11-Aminoundecanoic acid. Caprolactam by Beckmann rearrangement of cyclohexanone oxime. HPO process and Toray process to caprolactam. Other caprolactam synthesis: SNIA and UCC processes. Lauryl lactam.

Aromatic compounds
BTX from hard coal coking and gasoline catalytic reforming. Conversion of aromatic hydrocarbons: hydrodealkylation, isomerization, disproportionation and transalkylation. Benzene derivatives: ethylbenzene, cumene, styrene. Phenol (alkaline fusion, Dow process, Hock process). Aniline and derivatives: diisocyanates. Oxidation products of naphthalene and xylenes: dicarboxylic aromatic acids.

Other topics
Explosives, fragrances and pesticides.

Reference Texts
H-J Arpe Industrial Organic Chemistry 5th Edition Wiley-VCH.