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FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Chemistry Department

Adsorption Science and Technology

Research Unit of Adsorption Separation and Process Engineering

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Objectives

The research is focused on the development of novel adsorption processes that use alternative solvents and adsorbent materials. Combined competences for experimental and computational work are a focal point.

The work is multidisciplinary since it covers i) materials science, ii) chemical engineering, iii) process development and iv) modeling and molecular simulation fields.

The target applications are primarily gas storage, separation and purification of effluents with economic and environmental interest.

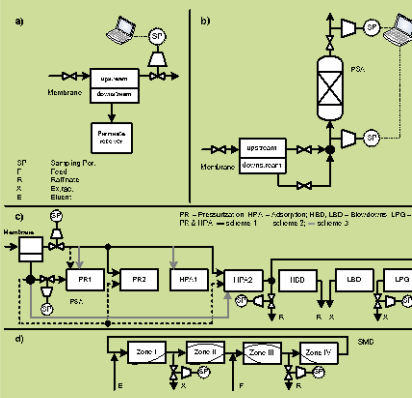
Methodology

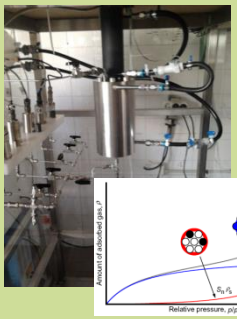
Materials: Activated Carbons; Zeolites (4A, 5A, 13X); Monoliths; Clays; Carbon Nanotubes; Metal-Organic Frameworks (MOFs); Ionic Liquids

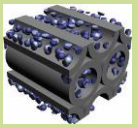
Target Gases/Mixtures & Intervention Areas: Natural Gas & odorants; Alkanes & Alkenes; Off-gas, biogas & syngas; recovery/purification/cleaning of gases such as CO2, N2 and H2

Methods:

i. Sorption equilibrium and kinetics through gravimetry & volumetry
ii. Fixed-Bed Breakthroughs with stream analysis by online mass spectroscopy
iii. Process development (PSA;SMB) with integration of computational modeling (process & GCMC) / control & optimization / experimental data







Expected Results

Development of novel 'Green' Adsorption Separation Processes:

i. Pressure swing adsorption (PSA): separation according to the species' molecular characteristics and affinity for an adsorbent, which preferentially adsorbs the target gas at high pressure. The cyclic process then swings to low pressure in order to desorb and regenerate the solid.
ii. Simulated moving-bed (SMB): HPLC variant used for difficult separations; is brought about by a valve-and-column arrangement that is used to lengthen the stationary phase indefinitely.
iii. PSA/Membrane hybrid systems; Pressure swing/SMB processes

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