7.
Exposing expanded beds to PEPT

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The rapid detection of a tracer particle labelled with a positron emitting radioisotope forms the basis of a powerful technique known as positron emission particle tracking (PEPT). A positron is a positively charged electron or anti-electron, and when it collides with an electron the two species annihilate, releasing energy in the form of a pair of back-to-back 511 keV gamma-rays. In PEPT the simultaneous detection of these two gamma-rays is achieved a 'positron camera' which defines a line spatially very close to where the decay must have occurred. By detecting the position of a small number of pair of X-rays and triangulating these in 'pseudo' real-time the position of a tracer can be determined, which makes the technique an exceptionally useful tool for rapid diagnostics and process development.

The world's first application of the PEPT technique to the study of liquid expanded beds was unveiled in the summer of last year (Liu et al., 2006). Since then we have extended our interrogation of EBA by PEPT to encompass a wider range: of tracer particles; commercial types of expanded bed matrices; and mobile phases. We inserted single long-lived $^{61}Cu^{2+}$ and $^{66}Ga^{3+}$ loaded positron emitting tracer particles of varying size, density and material into expanded beds of three different adsorbent preparations, varying in size distribution, density and material of construction, and have tracked their movement with a new PEPT camera. The technique provides a unique insight into the manoeuvrings within an expanded bed. All will be revealed.

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Reference

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8.
Purification of clavulanic acid from fermentation broth using zeolites

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The beta-lactam antibiotics were discovered in the early twentieth century (Buynac, 2006). They represent about 65% of the antibiotics commercialized in the world. The clavulanic acid (CA) is a secondary metabolite produced by *Streptomyces clavuligerus*, which is known as a potent inhibitor of beta-lactamase. The pharmaceutical industry has demonstrated an increasing interest for the CA, so that the importance of new and improved production methods has increased, mainly the one related to the mechanisms of separation and purification. The zeolites are microporous crystalline solids of inorganic nature, which contain aluminum, silicon and oxygen arranged in well-defined three-dimensional structures. They are widely used in the bioseparation processes due to their molecular size selectivity. The purpose of this work is to study the separation and purification processes of CA from fermentation broth using zeolites, selecting the most appropriate zeolite and compensation ion, as well as the technique of separation. Naturals and synthetics zeolites, both modified by ion exchange with different introduced cations (Na^{1+}, K^{1+}, Ba^{2+}, Ca^{2+}, Mg^{2+}, Sr^{2+}), are being used in the screening to select the more adequate in the CA standard adsorption. The best results up to now were obtained with zeolites changed with Ba^{2+}, K^{1+} and Na^{1+} ions at 30 °C. The selected zeolite was characterized, and its composition, density, pore size distribution and superficial area (through nitrogen adsorption isotherm at 77 K) were determined. Adsorption kinetic studies were carried out at controlled temperature and agitation rate in a finite water bath. Reactions were performed with 5 g of zeolite in 100 mL of CA standard solution the CA concentrations were analyzed through the reaction with imidazole by HPLC (Foulstone and Reading, 1982). Isotherms were constructed at 10 °C, 20 °C and 30 °C.

References

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9.
Primary purification of a fused protein precursor of the human insulin utilizing aqueous two-phase systems

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The advances in genetic engineering, recombinant DNA technology and biotechnology, in general, allowed the large-scale production of several physiologically active substances, such as pharmaceutical products, vaccines and hormones. However, the development of the purification techniques for these biological materials has been slow compared to the advances in the production techniques. According to Bensch et al. (2007), a considerable technological effort in scale and costs during downstream processing has to be faced. The liquid–liquid extraction in aqueous two-phase systems has been shown as a promissing alternative for separation of several biological substances, according to Hart et al. (1995) and Rito-Palomares (2004).