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INSTITUTE FOR MOLECULAR AND CELL BIOLOGY

BOLSA DE INVESTIGAÇÃO (M/F)

Referência: PTDC/CTM/100627/2008

Título do Projecto: "Thin-layer nanofiltration membranes using engineered biopolymers for seawater desalination pre-tretament processes"

Código interno: PR071706

Está aberto concurso para recrutamento de um(a) bolseiro(a) de Investigação para colaborar no projecto acima referido, financiado pelo programa COMPETE - Programa Operacional Factores de Competitividade na sua componente FEDER e pelo orçamento da Fundação para a Ciência e a Tecnologia na sua componente OE.

A bolsa, em regime de exclusividade, terá a duração de 1 ano eventualmente renovável, com início previsto em 1 de Maio de 2010.

O valor mensal da bolsa será de € 745,00, pago por transferência bancária (preferencialmente).

Local de trabalho: Unidade de Investigação de Microbiologia Celular Aplicada, IBMC, Porto

Programa de trabalho: (ver sumário em anexo).

Perfil pretendido:
Os candidatos devem possuir licenciatura na área das Ciências Biológicas, Biomateriais ou afins. Dá-se preferência a candidatos com experiência na área.

O prazo para recepção de candidaturas decorre de 8 a 22 de Abril de 2010.
As propostas deverão incluir CV e uma carta de referência e ser enviadas por correio electrónico para o e-mail candidaturas@ibmc.up.pt com indicação do código interno (PR071706).

Após avaliação do CV, os candidatos pré-seleccionados poderão ser chamados para entrevista.

A contratação será regida pelo estipulado na legislação em vigor relativamente ao Estatuto de Bolseiro de Investigação Cientifica, nomeadamente a Lei 40/2004, de 18 Agosto, e o Regulamento de Bolsas de Investigação Científica do IBMC (www.ibmc.up.pt/fellowships.php).

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Thin-layer nanofiltration membranes using engineered biopolymers for seawater desalination pre-treatment processes

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Project Summary:

Nowadays, water demand already exceeds supply in many parts of the world and as the world population continues to increase, even more areas are expected to experience this imbalance in the near future. Water scarcity is therefore a global problem, imposing the necessity to develop technologies able to make use of poorer quality source waters for drinking water production. Once considered as an expensive, ultimate solution for marginal municipal domestic and industrial water supply, desalination technology is becoming increasingly affordable. Drinking water is prepared from seawater primarily by reverse osmosis (RO) membrane process and multi-stage flash distillation (MSF). Reverse osmosis is less energy demanding compared to the multi-stage flash distillation, and this makes it more economically attractive. Nevertheless, many challenges still remain for seawater desalination using reverse osmosis membranes (SWRO), such as the rejection levels for salt and specific inorganic components such as boron, stabilization of the treated water and fouling of the membranes. As a consequence a lot of effort is being placed in the R&D of new membranes for water treatment purposes. One of the crucial factors determining the efficiency of a seawater desalination process is the feed pre-treatment. Cleaning the feed water to the highest level possible before it reaches the expensive and delicate reverse-osmosis membranes is halfway to an efficient SWRO process. Pressure-driven membrane processes are the new trend in pre-treatment systems. Among these, the introduction of nanofiltration (NF) membranes in a pre-treatment step for SWRO processes, will lead to a breakthrough in seawater desalination via: i) preventing the fouling of SWRO membranes by removal of suspended solids and bacteria, ii) preventing scaling by removal of scale forming hardness ions, iii) lowering required pressure to operate SWRO plants by reducing the total suspended solids in seawater, and iv) reducing the amount of monovalent ions. Among the most innovative membranes combining high flux and mechanical strength, the thin-film composite (TFC) NF membranes are expected to be a key component in any water purification technology in the future. However, the currently used materials (ceramic and specialized polymers) for membranes production, besides of being rather expensive, are not efficient for low molecular weight contaminants. Thus, the major objective of this project is the production of highly efficient TFC nanofiltration membrane systems for seawater desalination pre-treatment, based on nanoengineered biopolymers using novel functionalization tools. Novel cyanobacterial exopolysaccharides and fungal chitosan as renewable and sustainable feedstock will be used for membranes production. These oppositely charged natural biopolymers and the suitable combination thereof will provide membrane materials with versatile properties for removal of charged particles, pH switchable actuation, improved selectivity and reversible self-cleaning. Innovative electrospinning and phase separation methodologies will be used to generate cost competitive membranes with appropriate physico-chemical properties. Advanced physical and enzymatic tools will be applied for nanoscale membrane functionalization to impart antifouling and self-cleaning properties. Therefore, the project will develop NF membranes with enhanced performance from sustainable bioresources using environmentally friendly and/or solvent-free technologies. The proponent entity, IBMC, has been working for several years with a novel class of exopolysaccharide (EPS) produced by cyanobacteria showing several interesting features and peculiar functional groups. The partner CENTI has the expertise and know-how in what concerns polymers, surface engineering and membranes assembly by electrospinning and wet-phase methods. Additionally, it has in its facilities top leading equipment for membrane preparation and functionalization, like plasma and PVD/CVD/PML coating techniques. Therefore, this project will contribute to the state-of-the art in membrane research with: i) Bio-synthesis of novel polymers with controlled architecture for subsequent tailored membrane preparation; ii) Preparation of a highly efficient composite membranes combining synergistically different functions provided by the individual polymer materials; and iii) Advanced enzymatic surface functionalization techniques for yielding novel barrier structures or enabling the combination of existing barrier structure with tailored modes of interactions.

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