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Photo electrochemical assay of global antioxidants capacity in foods

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Reactive oxygen species (ROS) represent an important class of radical species generated in biological systems, and usually include super oxide, H2O2 and OH radicals. High concentration of ROS can result in unrestricted oxidation of DNA, protein and membrane lipids, which in turn lead to oxidative destruction of the cell and cause serious diseases such as cancer, cardiovascular disease, diabetes mellitus, neurodegenerative disease and aging. Fortunately, antioxidants (like Glutathione, Lipoid acid, Uric acid and Flavonoids, etc.) can effectively scavenge ROS to protect organism. Despite the presence of antioxidant protection in human body, there are still some free radicals which will cause oxidative damage. So intake of antioxidants through food can make additional protections. So to assess the antioxidant capacities is important in science and practice for human's healthy. In our research works, we explored a few synthesis of radical-generated photo-catalysts to mimic the endogenous generation of reactive radicals, which can be interacting with majority of antioxidants in foods, as a result, global antioxidant capacity, such as wine, coffee, tea and some juices, can be measured by such a photo electrochemical method. In addition, a novel analytical instrument is also being developed in our group.

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Binding of methacrylate-based monoliths to PEEK supports for HPLC separations

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Porous monolithic materials are becoming increasingly popular as stationary phases for miniaturized separation techniques. Monoliths have high permeabilities, which enables excellent performance for the fast separation of large molecules. From a chemical viewpoint, the typical monolith consists of a cross-linked polymer backbone that carries the functional groups providing the dedicated selectivity. Monoliths are mostly prepared in fused silica capillaries to be used as separation media in capillary HPLC and electrochromatography. For this purpose, silanization of the inner surface is required to assure binding of the monolith to the silica support. This avoids both ejection of the monolith under external pressure and peak tailing due to gaps located close to the support walls. However, the small inner diameters of silica capillaries (75-520 μm) prevent their use in conventional HPLC. Therefore, there is a need of developing methods to covalently bind monoliths to other supports commonly available in much larger inner diameters than silica capillaries. In this work, procedures to modify the surface of Poly Ether Ether Ketone (PEEK) tubes so that they bind with poly methacrylate-based monoliths for HPLC separations, are described and compared. For this purpose, 0.75 mm i.d. PEEK tubes were used. After selection of binding procedure, several polymerization variables (monomer/cross-linker ratio, type and content of initiator, among others) were studied in order to tailor the chromatographic performance of the resulting columns. Chromatographic tests were applied to provide information about the anchoring of the monolith to the tube wall. Also, mixtures of alkylbenzenes and organophosphorus compounds were used to characterize the chromatographic performance of the developed stationary phases.

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