



BILKENT UNIVERSITY

unam - INSTITUTE of MATERIALS SCIENCE & NANOTECHNOLOGY

FACULTY OF SCIENCE

MATERIALS SCIENCE and NANOTECHNOLOGY GRADUATE PROGRAM SEMINAR

“New separation media in liquid chromatography”

Prof. Ali Tuncel

Hacettepe University, Chemical Engineering Department

In recent years, the research effort on column technology has been dominantly focused on the synthesis of new separation media particularly for nano & micro-liquid chromatography (nano or micro-LC) and capillary electrochromatography (CEC). For these modern techniques, the stationary phases can be designed either in the microparticulate form or in the monolithic form.

Capillary electrochromatography mostly using monolithic stationary media re-emerged in the mid-1990s as a promising chromatographic method with excellent separation efficiencies and peak capacities compared with traditional liquid chromatography.

Capillary monolithic columns have been mostly preferred for nano and micro-liquid chromatography applications. However, at the minima of the van Deemter plots, the separation efficiencies achieved for a small, unretained analyte were still reasonably lower than those obtained with microparticulate stationary phases.

“Activated swelling procedure”, “Seeded emulsion polymerization”, “Staged shape template polymerization”, and “Two-stage precipitation polymerization” are the common strategies particularly used for the synthesis of relatively apolar, hydrophobic monodisperse-porous particles as microparticulate stationary phases. However, limited attempt was found in the literature for the synthesis of rigid-macroporous polymer beads as polar, hydrophilic packings. For this reason, a part of our recent studies were collected on the synthesis of chromatographic packing materials in the microparticulate form with hydrogel character.

This presentation contains our recent research focused on the synthesis of new stationary media both in the monolithic and microparticulate forms for micro-liquid chromatography and capillary electrochromatography techniques.

The stationary media for micro-liquid chromatography were designed and synthesized in the form of highly monodisperse, rigid, macroporous hydrogel beads. These beads were newly synthesized by a modified seeded polymerization technique based on the copolymerization of polar acrylic crosslinking agents with glycerol functionality. The effects of seed latex/porogen and seed latex/monomer ratios on the size, monodispersity and porosity characteristics of resulting particles were investigated.

Poly(GDMA-co-GDGDGA) particles were successfully tried as a stationary medium for aqueous size exclusion chromatography in micro and semi-micro-HPLC for the MW determination of water-soluble polymers by using dextran and poly(ethylene oxide) standards.

Rigid, macroporous hydrogel beads with reactive character were obtained by a modified seeded polymerization technique based on the copolymerization of hydrophilic or hydrophobic monomers with terminal chlorine moiety with a vinyl or acrylate based crosslinking agent.

Monolithic stationary media for CEC were synthesized in the form of capillary monoliths. These studies included the following titles:

Establishment of a simple porogen system for butyl methacrylate based capillary monoliths synthesized with acrylic crosslinkers with different alkyl chain lengths

Development of vinyl ester based new monoliths

Design and synthesis of fluorinated monolithic stationary media with different polarities

The monolithic separation media were successfully tried in CEC for the separation of aromatic hydrocarbon derivatives with the theoretical plate numbers up to 350.000 m⁻¹.

Date : January 22 , 2010 (Friday)

Time : 15:40

Place : Faculty of Science Building, A Block, Seminar Room (SA 240)

Tea and cookies will be served after the seminar