**Automated Desalting Apparatus**

By purifying field samples, this technology can be used for monitoring of water quality for applications in chemical, manufacturing, and farming industries.

NASA's Jet Propulsion Laboratory, Pasadena, California

Because salt and metals can mask the signature of a variety of organic molecules (like amino acids) in any given sample, an automated system to purify complex field samples has been created for the analytical techniques of electrospray ionization/mass spectroscopy (ESI/MS), capillary electrophoresis (CE), and biological assays where unique identification requires at least some processing of complex samples. This development allows for automated sample preparation in the laboratory and analysis of complex samples in the field with multiple types of analytical instruments.

Rather than using tedious, exacting protocols for desalting samples by hand, this innovation, called the Automated Sample Processing System (ASPS), takes analytes that have been extracted through high-temperature solvent extraction and introduces them into the desalting column. After 20 minutes, the eluent is produced. This clear liquid can then be directly analyzed by the techniques listed above. The current apparatus including the computer and power supplies is sturdy, has an approximate mass of 10 kg, and a volume of about 20x20x20 cm, and is undergoing further miniaturization.

This system currently targets amino acids. For these molecules, a slurry of 1 g cation exchange resin in deionized water is packed into a column of the apparatus. Initial generation of the resin is done by flowing sequentially 2–3 bed volumes of 2N NaOH and 2N HCl (1 mL each) to rinse the resin, followed by ~5 mL of deionized water. This makes the pH of the resin near neutral, and eliminates cross sample contamination. Afterward, 2–3 mL of extracted sample is then loaded into the column onto the top of the resin bed. Because the column is packed tightly, the sample can be applied without disturbing the resin bed. This is a vital step needed to ensure that the analytes adhere to the resin.

After the sample is drained, oxalic acid (1 mL, pH 1.6-1.8, adjusted with NH₄OH) is pumped into the column. Oxalic acid works as a chelating reagent to bring out metal ions, such as calcium and iron, which would otherwise interfere with amino acid analysis. After oxalic acid, 1 mL 0.01 N HCl and 1 mL deionized water is used to sequentially rinse the resin. Finally, the amino acids attached to the resin, and the analytes are eluted using 2.5 M NH₄OH (1 mL), and the NH₄OH eluent is collected in a vial for analysis.