

## Lasers Add Lines to Capillary Electrophoresis

**L**aser-induced native fluorescence detection in capillary electrophoresis has opened new applications and areas of research, but the technology has been forced to rely on either mainframe lasers or frequency-doubled Ar-ion or Kr-ion lasers. Although effective, these lasers can cost tens of thousands of dollars.

Hollow cathode lasers, such as

NeCu and HeAg sources, are roughly the same size and weight as HeNe lasers and consume about the same amount of power, but they emit at several wavelengths, including 224, 248, 260 and 270 nm. A complete turnkey system costs about \$10,000.

It was only a matter of time before someone sampled the technology for capillary electrophoresis. That "someone" was a pair of

chemists at the University of Illinois in Urbana. Professor Jonathan V. Sweedler and graduate student Xin Zhang applied a NeCu laser to native fluorescence detection in capillary electrophoresis.

"Cost and available wavelengths were motivators," Sweedler said. "Many of the [NeCu's] wavelengths are not accessible using common frequency-doubled lasers."

20 PHOTONICS SPECTRA

MARCH 2002

The NeCu laser was supplied by Photon Systems of Covina, Calif., and its performance was compared with data collected with help from the lab's Innova 300 Ar-ion laser, supplied by Coherent Inc. in Palo Alto, Calif. The same capillary electrophoresis system was used with both lasers, but the Ar-ion emitted at 257 nm, and the NeCu laser delivered a 248.6-nm beam.

Sweedler and Zhang compared the level of detection for seven compounds: tryptophan, tryptamine, serotonin, N-acetylserotonin, 5-hydroxyindole-3-acetic acid, tyrosine and dopamine. In short, they discovered that the

NeCu's detection limits for serotonin and dopamine were comparable to those obtained from the frequency-doubled Ar-ion. For other compounds — tryptophan and the indolamines — performance was slightly poorer. But Sweedler pointed out that the technology's potential is complementary rather than competitive with Ar-ion lasers.

"[It] depends on the particular application, and how important that reduction in level of detection matters," he said. "If the samples contain tryptophan at 100 times the level of detection, then the cheaper and simpler laser would be better. If the samples

are close to the level of detection, this would not be true."

The researchers plan to apply other hollow cathode laser excitation lines, including the 272-nm line from the NeCu, the 298.1-nm line from a HeAu laser, and the 224-nm line from a HeAg laser, all of which should improve performance for specific applications. They predict, for instance, that 272-nm excitation should improve the measurement of tyrosine and catecholamines, which strongly fluoresce when excited at that wavelength. □

Daniel C. McCarthy  
*Analytical Chemistry*, Nov. 15, 2001, pp. 5620-5624.