

The Gas Field Ion Source: Extension to Species Beyond Helium

(Or Why Some Noble Gases are More Noble Than Others)

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In the last 8 years, the gas field ion source (GFIS) has been commercialized with the purpose of producing a focused helium ion beam useful for both sub-nanometer imaging and a variety of nanofabrication techniques. While this new technology is gaining wider acceptance, many enthusiasts suggest that the same GFIS might be put to use for other gas species to permit an ion source in which virtually any gas species can be selected. The reality is that helium is a remarkable gas species that is uniquely suited to the GFIS. To date, the 'beyond helium' efforts have concentrated on making a neon beam function effectively.

For the GFIS, neon is the second favorite gas species, but still there are monumental differences compared to its lighter brother, helium. Neon will ionize at about 75% of helium's field strength requiring a lowering of the field that otherwise serves to protect the ion source. And while neon is not quite able to condense on the surface of the cryogenic emitter (75 Kelvin), it does tend to randomly adsorb and desorb on the emitter causing emission fluctuations over time. This talk will present an overview of the latest results with an emphasis on the technical challenges to its stability and lifetime.