DC25s - Application Note

Low Energy Nitrogen Ions

Nitrogen-doped Endohedral fullerenes, such as $N@C_{60}$, have generated considerable interest due to their potential properties in quantum computing and as building blocks for nanoscale devices. One method of forming these molecules is by ion implantation of nitrogen ions. In this method C_{60} is evaporated onto a target whilst simultaneously being irradiated with low energy nitrogen ions. For successful implantation the energy of the ions is critical. If the energy is too low then the ions cannot penetrate the cage; if it is too high then the cage can be destroyed. The typical implantation energy is around 40eV (ref. 1).

The DC25s ion source is capable of generating nitrogen ions between 10eV and 200eV and produces very high ratio of N^+ to N_2^+ ions. Figure 1 shows a mass spectrum of 10eV ions from the source. The ratio of N^+ to N_2^+ is approximately 8:1. This high N^+ content of the beam is desirable for the ion implantation process.

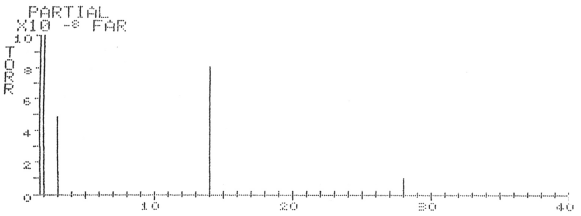


Figure 1

Another important factor which affects the yield of $N@C_{60}$ molecules is the ion current produced by the source. Figure 2 shows the variation of ion current with ion energy.

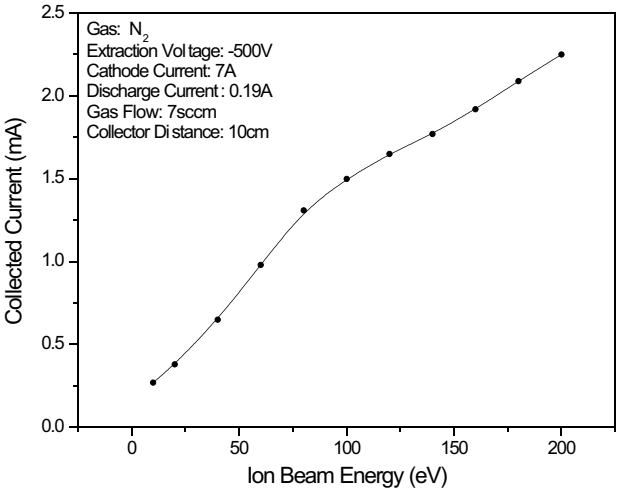
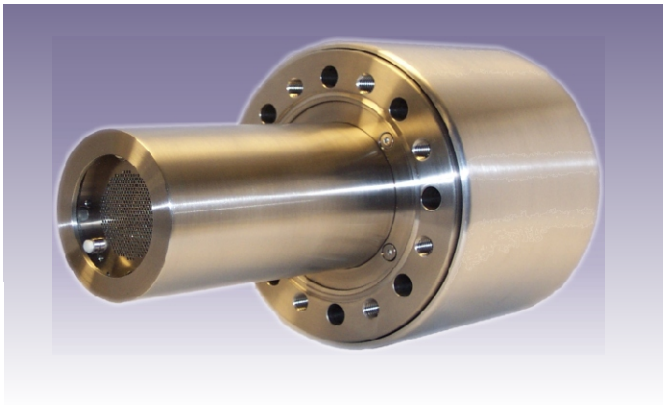


Figure 2

The DC25s source is highly suited to this new fullerene implantation process. It can also be used with other gases such as Ar or O_2 for a range of alternative applications.



1. "Atomic nitrogen in C_{60}:$N@C_{60}$" A. Weidinger et al. Appl. Phys. A 66, 287-292 (1998).

Oxford Applied Research
Crawley Mill
Witney
Oxon. OX299SP UK

Tel: +44 1993 773575
fax: +44 1993 702326
email: sales@oaresearch.co.uk
www.oaresearch.co.uk