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Bertrand et al.

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(54) **METASTABLE ATOM BOMBARDMENT SOURCE**

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(73) Assignee: **Universite de Montreal**, Montreal (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 122 days.

This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

(63) Continuation-in-part of application No. PCT/CA99/00502, filed on Jun. 1, 1999, which is a continuation of application No. 09/088,079, filed on Jun. 1, 1998, now Pat. No. 6,124,675.

(51) **Int. Cl.**[7] **H01J 7/24**

(52) **U.S. Cl.** **315/111.91**; 315/111.81; 315/111.21; 250/426; 250/427; 313/359.1

(58) **Field of Search** ..... 315/111.81, 111.21, 315/111.71, 111.91; 250/281, 423 R, 424, 426, 427; 313/359.1, 361.1

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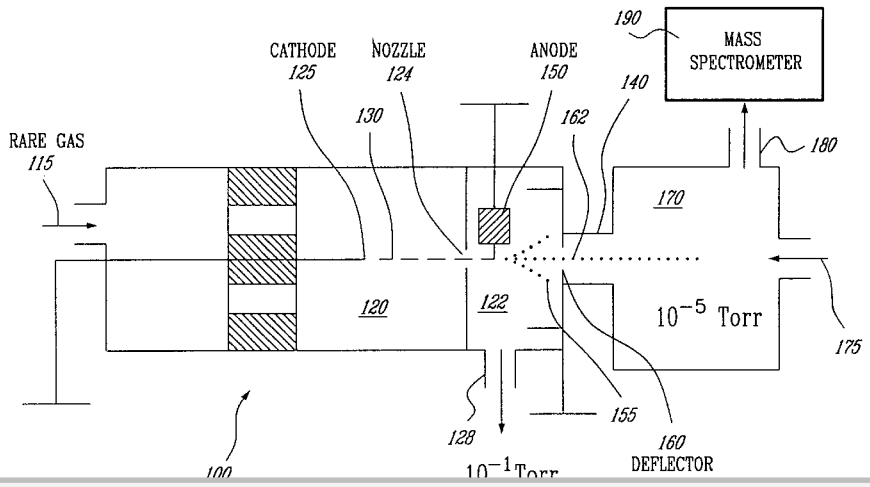
(57) **ABSTRACT**

The metastable atom bombardment source provides a charged particle free beam of metastable species that can be used to bombard and ionize organic and inorganic substances in a gas phase. The metastable atoms are produced by inducing a discharge in a gas (rare gases or small molecules). The discharge is curved between the cathode and anode, with the cathode located in a medium pressure zone and the anode located off-axis in a low pressure zone. A nozzle located between the cathode and the anode provides a collimated beam of metastable atoms of low kinetic energy that is directed at an ion volume containing the substances to be analyzed. By selecting the energy of the metastable state, selective fragmentation of molecules, particularly large molecular weight molecules, can be carried out.

4 Claims, 6 Drawing Sheets



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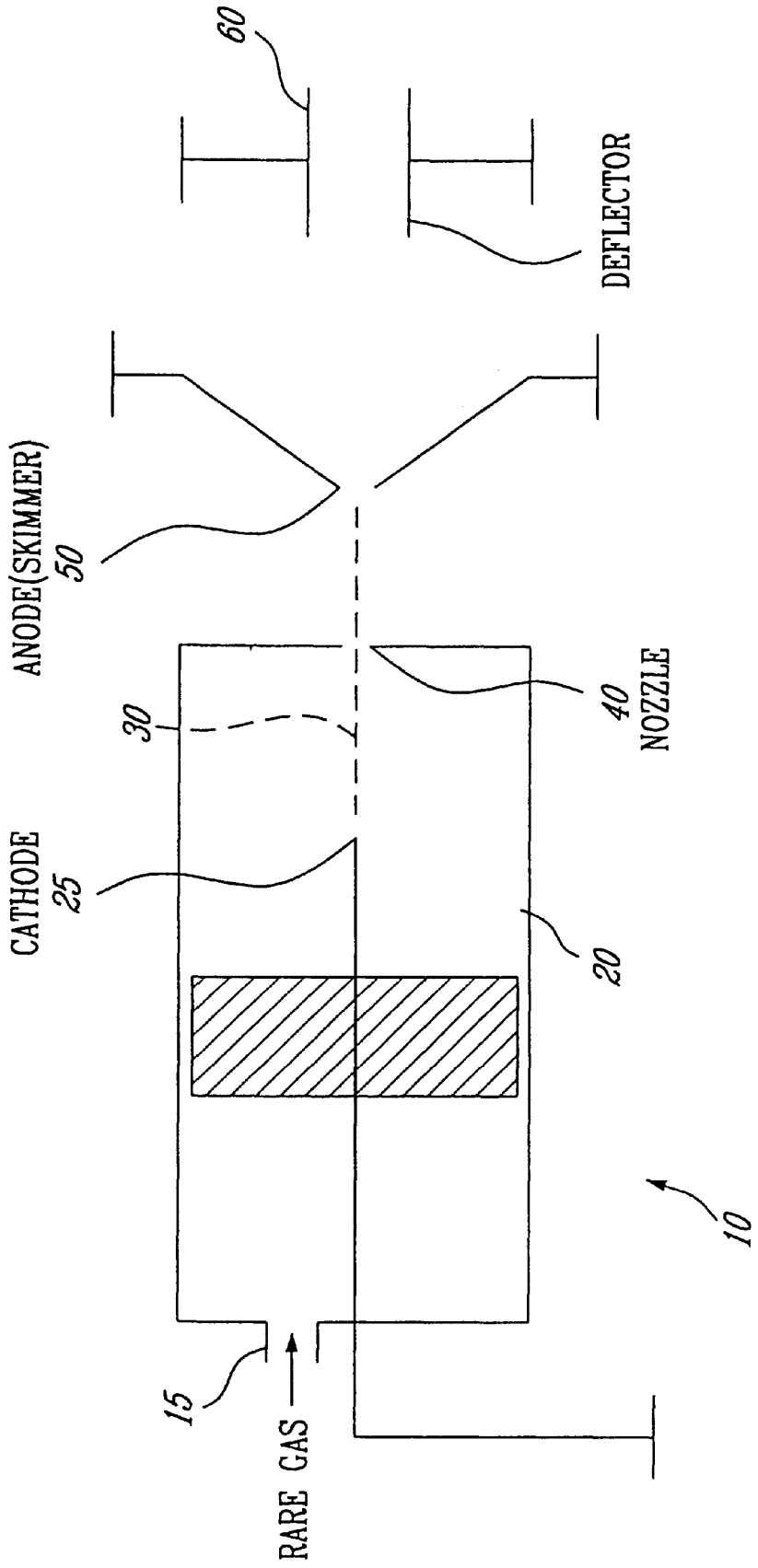
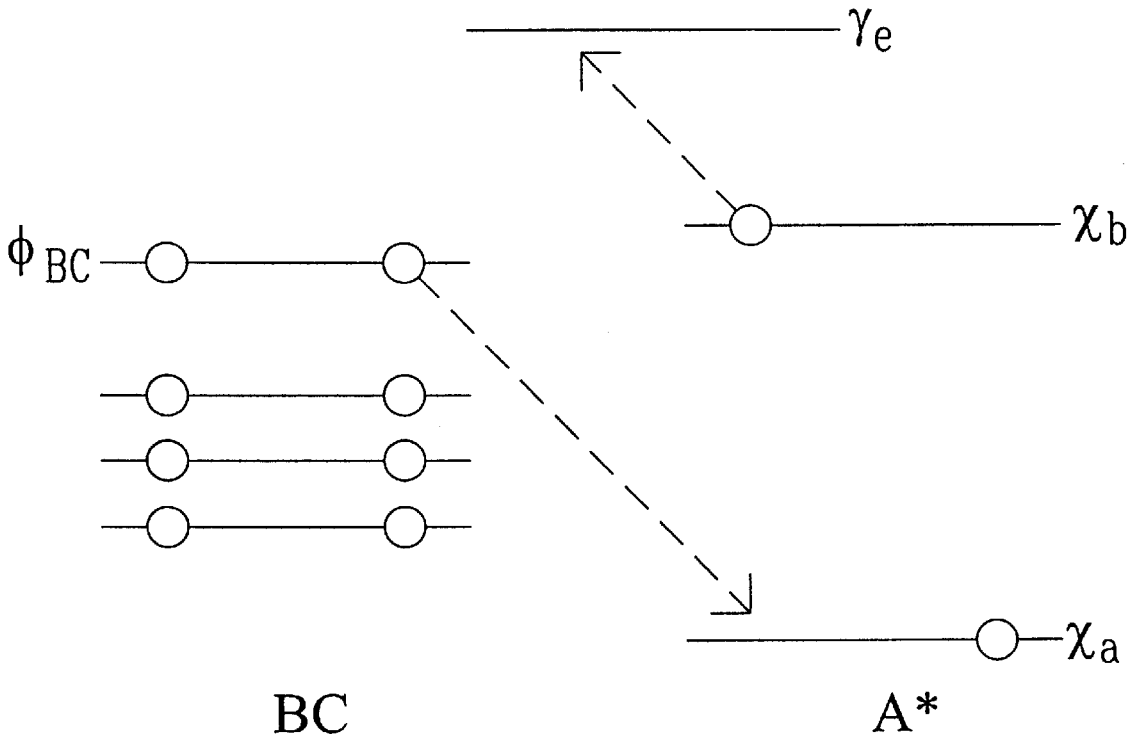


FIG. 1 (PRIOR ART)



$$A^* + BC \rightarrow A + BC^+ + e^-$$

$$A^* + BC \rightarrow A + B^+ + C + e^-$$

$$A^* + BC \rightarrow ABC^+ + e^-$$

FIG. 2 (PRIOR ART)

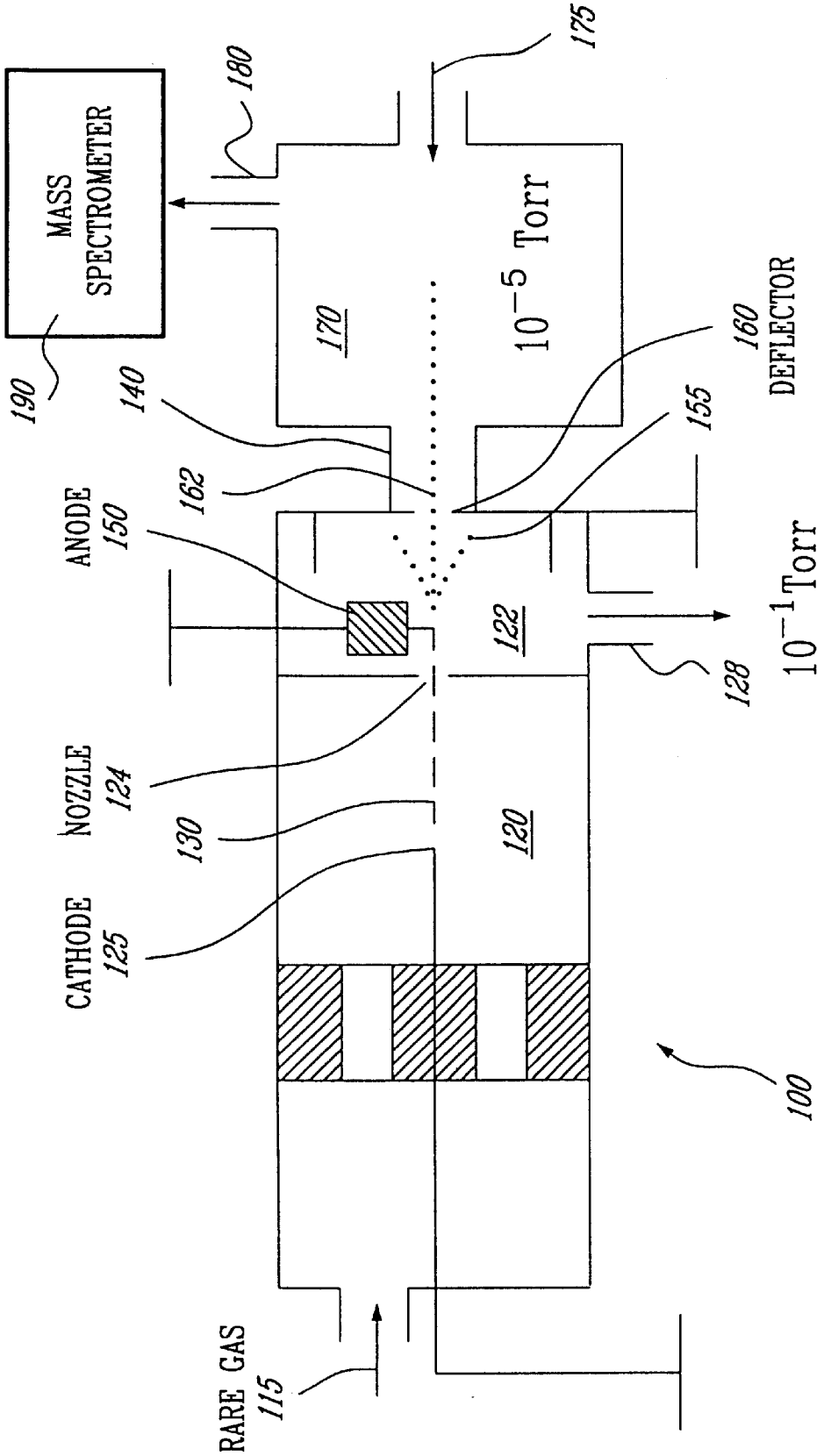


FIG. 3

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