Claims

1. A mass spectrometer for dispersing ions along a focal plane in accordance with their mass./charge ratio, the spectrometer comprising a detection apparatus, wherein said first direction (Z) is perpendicular to the plane in which the ions are dispersed, and wherein said detection apparatus (100, 200, 300, 400) comprises
an ion beam inlet (102, 302);
a detection front, the detection front being arranged on said focal plane so that said dispersed ions impinge on the detection front, the detection front comprising the entry face (112, 212, 312, 412) of at least one microchannel plate, MCP, assembly (110, 210, 310, 410), wherein the entry face extends along the first direction (Z), wherein the MCP assembly is configured for receiving, along a second direction (X) perpendicular to said first direction, a plurality of dispersed ions (10) that impinge on its entry face and for generating, for each impinging ion, a corresponding amplified detection signal on its opposite exit face (114, 214);
at least one read-out anode (120, 220) for collecting said amplified detection signals, the anode being arranged at a distance to, and in parallel with the exit face of said at least one MCP assembly,
wherein the detection apparatus further comprises beam deflection means (130, 230, 330, 430) arranged downstream of said inlet at a distance from said entry face and configured for selectively deflecting incoming ion beams along said first direction (Z), so that the corresponding ions selectively reach different portions of the MCP assembly's entry face along said first direction (Z);
wherein the ion inlet, the beam deflection means, the detection front and the read-out anode extend along said second direction (X).

2. The mass spectrometer according to claim 1, wherein said beam deflection means (130, 230, 330) comprise a charged particle optics unit and a control unit (140, 440), the control unit being configured to dynamically control a deflection angle to be applied to the ion beam's propagation direction by the charged particle optics unit.

3. The mass spectrometer according to claim 2, wherein said charged particle optics unit comprises a pair of deflection plates (332).

4. The mass spectrometer according to claim 1, wherein said beam deflection means (420) comprise a charged particle optics unit and a control unit, the control unit being configured

to selectively dynamically control an opening angle within which the ion beams are scattered by the charged particle optics unit.

5. The mass spectrometer according to claim 4, wherein said charged particle optics unit comprises a Bradbury Nielsen Grid (432, 434).

6. The mass spectrometer according to any of claims 1 to 5, wherein the entry face of said at least one MCP assembly extends over 2 to 3 cm along said first direction (Z)

7. The mass spectrometer according to any of claims 1 to 6, wherein entry faces of a plurality of MCP assemblies extend over an aggregated length of at least 15 cm in said second direction (X).

8. The mass spectrometer according to claim 7, further comprising one dedicated read-out anode for each MCP assembly, and wherein said read-out anode extends along a corresponding MCP assembly's exit face.

9. The mass spectrometer according to any of claims 1 to 8, wherein the at least one read-out anode comprises a delay-line anode, a pixelated anode array, a resistive anode, a shaped anode, a single anode or any combination thereof.

10. The mass spectrometer according to any of claims 1 to 9, further comprising biasing means configured for applying a positive or negative floating electric potential to components of the apparatus, including the beam deflection means.

11. The mass spectrometer in accordance with any of claims 1 to 10, wherein the deflection means of said detection apparatus are arranged so as to deflect all dispersed ions exiting a mass filtering unit of the mass spectrometer.

12. The mass spectrometer in accordance with any of claims 1 to 11, wherein the detection front of said detection apparatus spans said focal plane so that any ions dispersed by a mass filtering unit of the mass spectrometer impinge there upon.

13. A method of using the mass spectrometer in accordance with any of claims 1 to 12, the method comprising the following steps:

a) dispersing ion species comprised in a secondary ion beam using a mass filtering unit of said spectrometer device, thereby generating a plurality of ion beams;

b) using the spectrometer's beam deflection means, deflecting said plurality of ion beams in accordance with a predetermined deflection angle along said first direction (Z) in which at least one MCP assembly extends

c) using the spectrometer's at least one read-out anode, reading out the amplified detection signal, as provided by said at least one MCP assembly;

d) repeating steps b) and c) at least once using a different predetermined detection angle.

14. The method according to claim 13, wherein steps ii) and iii) or respectively b) and c) are repeated so as to scan the charged particle beam or respectively the plurality of ion beams over the extent of the entry face of said at least one MCP assembly along said first direction (Z).

15. The method according to any of claims 13 or 14, wherein the beam deflection means comprise a charged particle optics unit and a control unit (140, 440), the control unit being configured to dynamically control a deflection angle to be applied to the charged particle beam's propagation direction by the charged particle optics unit, and wherein between two successive iterations of step ii) or respectively step b), the deflection angle is altered so that the spot generated during a first iteration by a deflected beam on the entry face of said at least one MCP assembly does not overlap with the spot generated during a second iteration by the same deflected beam.