Claims

1. An electrospray ion source for generating desolvated ions to be investigated analytically, having a spray capillary supplied with a spray solution, a first power supply for the generation of an electric drawing field at a tip of the spray capillary for establishing conditions for electrospraying, and a supply of gas which is instrumental in the generation of desolvated ions, and further comprising a heater device through which the gas is conducted towards the sprayed solution, a conductive element having a plurality of windings, which interleave and/or intertwine each other in opposite directions, near the heater device, and a second power supply connected to the conductive element having a plurality of windings to generate heat in the heater device by electromagnetic induction in order that the gas is heated while passing the heater device on its way to the sprayed solution.

2. The electrospray ion source according to Claim 1, wherein the second power supply is a low voltage, high current AC power supply delivering an alternating current with a frequency between 1 kilohertz and 1 gigahertz.

3. The electrospray ion source according to Claim 1 or Claim 2, wherein the conductive element is helically wound and the heater device is located within the inner width of the helically wound conductive element.

4. The electrospray ion source according to any one of Claims 1 to 3, wherein the conductive element having a plurality of windings is nested inside a hollow-cylindrical heater device in order to facilitate and/or improve containment of stray electromagnetic radiation.

5. The electrospray ion source according to any one of Claims 1 to 4, wherein the conductive element having a plurality of windings has a first segment of windings helically spiraling forward, then turning, and a second segment of windings helically spiraling backwards in between the gaps between the windings of the first segment.

6. The electrospray ion source according to any one of Claims 1 to 5, wherein the heater device is a hollow cylinder surrounding the spray capillary.

7. The electrospray ion source according to Claim 6, wherein the hollow cylinder tapers at a front end near the tip of the spray capillary so that exiting heated gas intersects the sprayed solution.

8. An electrospray ion source for generating desolvated ions to be investigated analytically, having a spray capillary supplied with a spray solution, a first power supply for the generation of an electric drawing field at a tip of the spray capillary for establishing conditions for electrospraying, and a supply of gas which is instrumental in the generation of desolvated ions, and further comprising a heater device which is a hollow cylinder surrounding the spray capillary and through which the gas is conducted towards the sprayed solution, a conductive element having a plurality of windings near the heater device, and a second power supply connected to the conductive element having a plurality of windings to generate heat in the heater device by electromagnetic induction in order that the gas is heated while passing the heater device on its way to the sprayed solution, wherein the hollow cylinder (i) is non-conductive and contains embedded metallic or otherwise conductive capillaries to conduct the gas, or (ii) contains non-conductive channels for the gas that have a conductive porous filling.

9. The electrospray ion source according to Claim 8, wherein the conductive porous filling inside the non-conductive channels comprises one of (i) bunches of metal or otherwise conductive wool and (ii) pieces of porously sintered metal.

10. The electrospray ion source according to Claim 9, wherein the wool is plated by an inert metal to avoid corrosion.

11. The electrospray ion source according to Claim 1 or Claim 2, wherein the heater device is a metallic or otherwise conductive plate with one or more channels to heat the gas, the plate having the form of a ring surrounding the spray capillary.

12. The electrospray ion source according to Claim 11, wherein the conductive element having a plurality of windings is located opposite the plate, likewise surrounding the spray capillary.

13. An electrospray ion source for generating desolvated ions to be investigated analytically, having a spray capillary supplied with a spray solution, a first power supply for the generation of an electric drawing field at a tip of the spray capillary for establishing conditions for electrospraying, and a supply of gas which is instrumental in the generation of desolvated ions, and further comprising a heater device which is a metallic or otherwise conductive plate with one or more channels to heat the gas, the plate having the form of a ring surrounding the spray capillary, and through which the gas is conducted towards the sprayed solution, a conductive element having a plurality of windings near the heater device, and a second power supply connected to the conductive element having a plurality of windings to generate heat in the heater device by electromagnetic induction in order that the gas is heated while passing the heater device on its way to the sprayed solution, further comprising at least one capillary standing out from the plate which conducts heated gas in a direction of the sprayed solution.

14. The electrospray ion source according to Claim 13, wherein the at least one capillary tapers radially inward such that the heated gas is conducted directly into the sprayed solution.

15. The electrospray ion source according to any one of Claims 1 to 14, wherein at least one conductive element having a plurality of windings and an associated heater device are arranged and located offset from the spray capillary such that a heated gas beam is directed to intersect a spray plume emanating from the spray capillary tip.

16. A system comprising:

    the electrospray ion source according to any one of Claims 1 to 15; and

    a spectrometer positioned downstream of the electrospray ion source to receive desolvated ions from the electrospray ion source for investigating the desolvated ions analytically.

17. The system according to Claim 16, wherein the spectrometer is a mass spectrometer, an ion mobility spectrometer or a combination of both.

18. The system according to Claim 16 or Claim 17, wherein the spectrometer receives the spray solution to be investigated analytically from an upstream substance separator.

19. A method for heating a gas in an electrospray ion source according to any one of Claims 1 to 15, used for investigating samples analytically, which gas is instrumental in the generation of desolvated ions as part of the electrospraying of an analyte solution, the method comprising:

    heating a heating device without contact by electromagnetic induction; and

    passing the gas to receive heat from the heating device.

20. The method for heating a gas according to Claim 19, wherein the gas is an inert desolvation gas which is directed into a spray plume upon being heated.

21. The method for heating a gas according to Claim 20, further comprising controlling the temperature of the gas by varying operating conditions of a power supply used to effect the electromagnetic induction.

22. The method for heating a gas according to Claim 21, wherein the operating conditions of the power supply are adapted to a time characteristic of the analyte solution to be investigated analytically.

23. The method for heating a gas according to Claim 22, wherein the adaptation of the operating conditions follows the time characteristic of the analyte solution during a substance separation run, the eluent of which is delivered as the analyte solution to the electrospray ion source.