CLAIMS

1. A droplet ejector for a printhead, the droplet ejector comprising: a substrate having a mounting surface and an opposite nozzle surface; a nozzle-forming layer formed on at least a portion of the nozzle surface of the substrate; a fluid chamber defined at least in part by the substrate and at least in part by the nozzle-forming layer, the fluid chamber having a fluid chamber outlet defined at least in part by a nozzle portion of the said nozzle-forming layer, the said nozzle portion comprising an inner portion located closer to the fluid chamber outlet and an outer portion located closer to a periphery of the nozzle portion; and either or both of an inner actuator arrangement formed on the inner portion of the nozzle portion of the nozzle-forming layer and an outer actuator arrangement formed on the outer portion of the nozzle portion of the nozzle-forming layer.

2. A droplet ejector according to Claim 1, in which at least one of the inner and/or outer actuator arrangement and the nozzle portion of the nozzle-forming layer are configured such that the inner portion of the nozzle portion curves in a first sense and the outer portion of the nozzle portion curves in a second sense opposite said first sense on activation.

3. A droplet ejector according to Claim 1 or 2, in which the outer portion of the nozzle portion of the nozzle-forming layer at least partially surrounds the inner portion of the nozzle portion of the nozzle-forming layer.

4. A droplet ejector according to Claim 1, 2 or 3, in which the inner actuator arrangement at least partially surrounds the fluid chamber outlet.

5. A droplet ejector according to any preceding claim, in which the inner actuator arrangement is substantially annular and/or in which the outer actuator arrangement is substantially annular.

6. A droplet ejector according to any preceding claim further comprising at least one electronic component integrated with the substrate.

7. A droplet ejector according to any preceding claim comprising an inner actuator arrangement which comprises one or more inner piezoelectric actuators, at least one of said

one or more inner piezoelectric actuators comprising an inner piezoelectric body provided between an inner pair of drive electrodes.

8. A droplet ejector according to Claim 7, in which the inner actuator arrangement consists of a single inner piezoelectric actuator which is substantially annular.

9. A droplet ejector according to any preceding claim comprising an outer actuator arrangement which comprises one or more outer piezoelectric actuators, at least one of said one or more outer piezoelectric actuators comprising an outer piezoelectric body provided between an outer pair of drive electrodes.

10. A droplet ejector according to Claim 9, in which the outer actuator arrangement consists of a single outer piezoelectric actuator which is substantially annular.

11. A droplet ejector according to Claim 10 as dependent on Claim 8, in which the single outer piezoelectric actuator surrounds the single inner piezoelectric actuator.

12. A droplet ejector according to any of Claims 9, 10 or 11 as dependent on Claim 7, in which both the inner and outer pairs of drive electrodes are electrically connected to a drive circuit configured to, when in use and connected to a power supply, apply a first potential difference between the inner pair of electrodes to cause deflection of the inner piezoelectric body in a first direction and to apply a second potential difference between the outer pair of electrodes to cause deflection of the outer piezoelectric body in a second direction opposite said first direction.

13. A droplet ejector according to any of Claims 7 to 12, in which the inner piezoelectric body or bodies and/or the outer piezoelectric body or bodies comprise one or more piezoelectric materials processable at a temperature below 450°C.

14. A droplet ejector according to any of Claims 7 to 13, in which the inner piezoelectric body or bodies and/or the outer piezoelectric body or bodies comprise one or more piezoelectric materials depositable at a temperature below 450°C.

15. A droplet ejector according to Claim 13 or 14, in which the one or more piezoelectric materials are PVD-deposited piezoelectric materials.

16. A droplet ejector according to Claim 13, 14 or 15, in which the one or more piezoelectric materials comprise aluminium nitride and/or zinc oxide.

17. A droplet ejector according to Claim 16, in which aluminium nitride further comprises one or more of the following elements: scandium, yttrium, titanium, magnesium, hafnium, zirconium, tin, chromium, boron.

18. A droplet ejector according to any of Claims 13 to 17, in which the one or more piezoelectric materials comprise ceramic material comprising aluminium and nitrogen and optionally one or more elements selected from: scandium, yttrium, titanium, magnesium, hafnium, zirconium, tin, chromium, boron.

19. A droplet ejector according to any of Claims 13 to 18, in which the one or more piezoelectric materials are non-ferroelectric piezoelectric materials.

20. A droplet ejector according to any of Claims 7 to 19, in which the inner piezoelectric body or bodies and/or the outer piezoelectric body or bodies have d_{31} piezoelectric constants having magnitudes less than 20 pC/N.

21. A droplet ejector according to any preceding claim, in which the mounting surface of the substrate comprises a fluid inlet aperture in fluid communication with the fluid chamber.

22. A droplet ejector according to any preceding claim, in which the fluid chamber is substantially cylindrical and the nozzle portion of the nozzle-forming layer is substantially annular.

23. A droplet ejector according to any preceding claim further comprising a protective layer covering the inner and outer actuator arrangements and the nozzle-forming layer.

24. A printhead comprising a plurality of droplet ejectors according to any preceding claim.

25. A printhead according to Claim 24, in which the plurality of droplet ejectors share a common substrate.

26. A printer comprising one or more printheads according to Claim 24 or 25.

27. A method of actuating a droplet ejector according to any of Claims 1 to 20, the method comprising: actuating the inner actuator arrangement and/or actuating the outer actuator arrangement to thereby cause displacement of at least a portion of the nozzle portion of the nozzle-forming layer and consequently ejection of fluid from the fluid chamber through the fluid chamber outlet.

28. A method according to Claim 27, in which the droplet ejector comprises both an inner actuator arrangement and an outer actuator arrangement, the method comprising: actuating both the inner actuator arrangement and the outer actuator arrangement to thereby cause displacement of at least a portion of the nozzle portion of the nozzle-forming layer and consequently ejection of fluid from the fluid chamber through the fluid chamber outlet.

29. A method according to Claim 28, in which the steps of actuating the inner actuator arrangement and actuating the outer actuator arrangement take place concurrently.

30. A method according to Claim 28 or 29, as dependent on Claim 12, in which actuating the inner actuator arrangement comprises applying a first potential difference between the inner pair of drive electrodes to cause deflection of the inner piezoelectric body and in which actuating the outer actuator arrangement comprises applying a second potential difference between the outer pair of drive electrodes to cause deflection of the outer piezoelectric body.

31. A method according to Claim 30, in which the first and second potential differences have opposing polarities such that the inner piezoelectric body and the outer piezoelectric body deflect in opposing directions.

32. A method according to Claim 30 or 31, in which the first and second potential differences are applied concurrently.