

melting point less than 150° C. are useful also. Most preferably, support 70 is such a layer of polyethylene, laminated onto a very thin layer of poly(ethylene terephthalate) (PET) to facilitate the application of heat. That is, by heating the backside of the PET, heat can be diffused through to the polyethylene without unduly weakening support 70. Useful thicknesses of the support include, e.g. 89 microns of polyethylene and 13 microns of PET.

The fusion of beads 90 to support 70 is readily done by depositing a 1% aqueous buffer suspension of the beads at the desired defined area, using a 0.1 molar concentration of a buffer comprising glycine at a pH of 8.5, containing 0.01% Thimerosal. This solution is then heated as follows: a heating iron is applied to the underneath surface 100, FIG. 2, using a temperature setting sufficient to render the polyethylene tacky. For example, a temperature of about 110° C. at the tip is useful. The tacky condition is sufficient to fuse the beads. A useful example is a heating iron available under the tradename EC 2001 ESD from Weller.

Microphotos of the result show a structure as illustrated in FIG. 3. At least the lower layer 92 of beads can be seen to have polyethylene that has wetted and sealed to those beads of layer 92. It is not clear that the plastic of support 70 has also wetted the upper layers, although there does appear to be some adhesion of the upper layers of beads to layer 92, by a mechanism not understood. That is, a layer perhaps of the buffer salts does appear coated over all the upper layers, as suggested by the dashed layer 102, FIG. 3. This is clearly not polyethylene, however, as layer 102 washes away when the sample solution passes by, leaving the structure shown in FIG. 3 without the layer 102.

When such a pile of beads was used to actually test for a targeted DNA, enough of the beads remained after the solution flowed past it, to produce a clear color stronger than any background signal on the support away from piles 80, 82, 84 or 86.

As a comparison example, an aqueous solution of the same beads was applied identically as described above, except that no buffer was present. When the heating iron was applied, too much heat appeared to be delivered, as the beads seemed to fuse/melt together to form a permanent overlayer of polyethylene somewhat analogous to layer 102, which, however, would not wash away. Furthermore, these beads are not capable of immobilizing targeted DNA, which indicates that either the oligonucleotides on the beads were denatured, or melting occurred so much that the oligonucleotides

were covered up. This comparison example suggests that the presence of the buffer salt is needed if fusion is done in this manner. However, it has been shown that the buffer salts (layer 102) can be washed away and the beads still function. Thus, the buffer is not needed in the test device for detection.

It will be readily appreciated that such anchoring of the beads is preferably achieved without the use of an adhesive composition, that is, without the use of a material different from the support or the beads to bind the beads to the support. Whatever mechanism is binding upper bead layers 94 to lower bead layer 92, we have found that, if fusion is not done by melting the support to the beads, substantially all the beads wash away even though the buffer salt may have been present.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

What is claimed is:

1. In a test device comprising inert beads to which reagents are attached, and an inert support on which said beads are disposed to react with a test sample liquid, the support and beads comprising different materials;

the improvement wherein said support is attached to said beads solely by being physically melt-fused to at least some of said beads, said material of said support being selected to have a melting point which is at least 20 degrees C. less than that of said material of said beads,

so that the fused beads cannot be washed off the support by the test sample liquid.

2. A test device as defined in claim 1, wherein said beads comprise a styrene copolymer and said support comprises polyethylene.

3. A test device as defined in claim 1, wherein said melting point of said support is less than 150° C., and said reagents on said beads comprise an oligonucleotide, so that said support can be melted without denaturing said oligonucleotide.

4. A test device as defined in claims 1, 2 or 3, and further including, in the device, indicator reagents for polymerase chain reaction amplification comprising a label.

5. A test device as defined in claim 2, wherein said support comprises a laminate of polyethylene and polyethylene terephthalate.

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