opening through which a convective flow is capable of passing to cool the support element.

The system for heating a specimen-bearing slide, in some embodiments, includes a convection cooling device coupled to the controller and configured to deliver a convective flow into the opening based on a signal from the controller. In certain embodiments, the convection cooling device includes at least one fan capable of producing the convective flow. In some embodiments, compressed air or motive air can be used.

The support element, in some embodiments, comprises stainless steel. In some embodiments, a portion of the support element between the support surface for carrying the slide and the conductive heater has a thermal conductivity equal to or less than about 20 W/m*K.

In view of the above, in accordance with a first aspect, there is provided a slide heating apparatus, comprising: a support element having a support surface configured to support a slide with a back side of the slide facing the support surface and a specimen-bearing surface of the slide opposite the back side of the slide; and a heater coupled to the support element, the slide heating apparatus being configured to deliver thermal energy non-uniformly across the support surface to the back side of the slide via conduction to substantially compensate for non-uniform heat losses associated with evaporation of a liquid on the specimen-bearing surface. The heater includes at least two spaced apart elongate portions for conductively heating side portions of the support surface and two end heating portions extending between the elongate portions, the two end heating portions are positioned to heat both a portion of the support surface for contacting an end of the slide and a portion of the support surface for contacting a region of the slide adjacent to a label of the slide.

In accordance with a second aspect, there is provided a method for heating a biological specimen carried on a slide, comprising: positioning a slide on a support element of a conductive slide heating apparatus such that a back side surface of the

slide faces the support element and a specimen-bearing surface of the slide faces away from the support element; and delivering heat non-uniformly across the back side surface of the slide via the support element to substantially compensate for evaporative heat losses associated with evaporation of a liquid on the specimen-bearing surface, wherein the evaporative heat losses are non-uniform across the specimen-bearing surface of the slide. The method further comprises maintaining a temperature variation, if any, across a portion of the specimen-bearing surface contacting a biological specimen equal to or less than about a 5ºC temperature variation while a support surface of the support element contacting the back side surface of the slide has more than a 5º temperature variation, and conductively heating the slide using thermal energy produced by a heating element of the conductive slide heating apparatus, wherein the heating element includes at least two spaced apart elongate heating portions and two end heating portions extending between the elongate heating portions, and the elongate heating portions and the end heating portions define a convection cooling pocket.

In accordance with a third aspect, there is provided a system for heating a specimen-bearing slide, comprising: a slide platen including a support element having a support surface, and a conductive heater positioned to heat the support element; and a controller programmed to control the system to produce a non-uniform heating profile along the support element so as to transfer thermal energy to a slide to produce a substantially uniform temperature profile along a specimen-bearing area of a specimen-bearing surface of the slide when a back side of the slide is supported by the support surface. The heater includes at least two spaced apart elongate portions for conductively heating side portions of the support surface and two end heating portions extending between the elongate portions, the two end heating portions are positioned to heat both a portion of the support surface for contacting an end of the slide and a portion of the support surface for contacting a region of the slide adjacent to a label of the slide.

BRIEF DESCRIPTION OF THE DRAWINGS

Non-limiting and non-exhaustive embodiments are described with reference to the following drawings. The same reference numerals refer to like parts or acts throughout the various views, unless otherwise specified.

Figure 1 is an isometric view of a specimen processing system in accordance with an embodiment of the disclosed technology.

Figure 2 is an exploded isometric view of the specimen processing system of Figure 1. Portions of a protective housing are shown removed.

Figure 3 is a detailed view of a portion of the specimen processing system of Figure 2.

Figure 4 is an isometric view of a slide ejector assembly in accordance with an embodiment of the disclosed technology.

Figure 5 is an isometric view of the slide ejector assembly of Figure 4 with protective plates shown removed.

Figures 6 and 7 are side views of the slide ejector assembly of Figure 4 with a slide carrier shown in different positions.

PATENT CLAIMS

1. A slide heating apparatus, comprising:

a support element having a support surface configured to support a slide with a back side of the slide facing the support surface and a specimen-bearing surface of the slide opposite the back side of the slide; and

a heater coupled to the support element, the slide heating apparatus being configured to deliver thermal energy non-uniformly across the support surface to the back side of the slide via conduction to substantially compensate for non-uniform heat losses associated with evaporation of a liquid on the specimen-bearing surface,

characterized in that the heater includes at least two spaced apart elongate portions for conductively heating side portions of the support surface and two end heating portions extending between the elongate portions, the two end heating portions are positioned to heat both a portion of the support surface for contacting an end of the slide and a portion of the support surface for contacting a region of the slide adjacent to a label of the slide.

2. The slide heating apparatus of claim 1, further comprising:

a convection assembly positioned to produce a convective flow that passes through a pocket defined by the heater to cool the support element.

3. The slide heating apparatus of claim 2, wherein the convection assembly includes a fan.

4. The slide heating apparatus of claim 1, further comprising:

a pair of sidewalls each having a thermally conductive portion and an insulating portion, the thermally conductive portion facing the slide.

5. The slide heating apparatus of claim 1, further comprising:

an over-molded holder comprising an insulating material, wherein the support element is positioned between and supported by sidewalls of the overmolded holder, the support element being over-molded to form a mounting base.

6. The slide heating apparatus of claim 5, wherein the insulating material has a thermal conductivity that is less than a thermal conductivity of a material of the support element.

7. The slide heating apparatus of claim 1, wherein at least one of the heater and the support element comprises mostly stainless steel by weight.

8. The slide heating apparatus of claim 1, wherein the support surface comprises stainless steel.

9. The slide heating apparatus of claim 1, wherein most of a material of the support element between the support surface and the heater is stainless steel.

10. The slide heating apparatus of claim 1, wherein a portion of the support element between the slide and the heater has a thermal conductivity equal to or less than about 20 W/m*K.

11. A method for heating a biological specimen carried on a slide, comprising:

positioning a slide on a support element of a conductive slide heating apparatus such that a back side surface of the slide faces the support element and a specimen-bearing surface of the slide faces away from the support element;

delivering heat non-uniformly across the back side surface of the slide via the support element to substantially compensate for evaporative heat losses associated with evaporation of a liquid on the specimen-bearing surface, wherein the evaporative heat losses are non-uniform across the specimen-bearing surface of the slide,

maintaining a temperature variation, if any, across a portion of the specimen-bearing surface contacting a biological specimen equal to or less than about a 5ºC temperature variation while a support surface of the support element contacting the back side surface of the slide has more than a 5º temperature variation, and

conductively heating the slide using thermal energy produced by a heating element of the conductive slide heating apparatus, wherein the heating element includes at least two spaced apart elongate heating

portions and two end heating portions extending between the elongate heating portions, and the elongate heating portions and the end heating portions define a convection cooling pocket.

12. A system for heating a specimen-bearing slide, comprising:

a slide holder platen including

a support element having a support surface, and

a conductive heater positioned to heat the support element; and

a controller programmed to control the system to produce a non-uniform heating profile along the support element so as to transfer thermal energy to a slide to produce a substantially uniform temperature profile along a specimen-bearing area of a specimen-bearing surface of the slide when a back side of the slide is supported by the support surface,

characterized in that the heater includes at least two spaced apart elongate portions for conductively heating side portions of the support surface and two end heating portions extending between the elongate portions, the two end heating portions are positioned to heat both a portion of the support surface for contacting an end of the slide and a portion of the support surface for contacting a region of the slide adjacent to a label of the slide.

13. The system of claim 12, wherein the support element comprises stainless steel.

14. The system of claim 12, wherein a portion of the support element between the support surface for carrying the slide and the conductive heater has a thermal conductivity equal to or less than about 20 W/m*K.