that this is caused by the increase of the surface tension of printed ink drops caused by the evaporation of water. The increase of the surface tension may cause puddling (coalescence) and/or dewetting.

There is therefore room for improvement of latex inks in relation to print quality, in particular on poorly absorbing media (e.g. machine coated or offset coated media), without compromising print quality on conventional media suitable for aqueous inkjet printing and plain paper.

It is therefore an object of the present invention to provide a latex ink composition suitable for obtaining a high print quality on a wide range of media, in particular an ink composition showing an improved dotgain on poorly absorbing media, such as machine coated or offset coated media in order to prevent or at least mitigate streakiness when used in a highly productive single pass printing process.

It is another object of the present invention to provide a latex ink composition that maintains a low surface tension during drying in order to prevent or at least mitigate puddling and dewetting, in particular on poorly absorbing media, such as machine coated or offset coated media.

SUMMARY OF THE INVENTION

These objects are at least partly achieved by providing an ink composition suitable for being ejected from an inkjet marking device at an operating temperature, the ink composition comprising:

- 1 - 40 weight% of a water-dispersible resin;
- 0.5 - 15 weight% of a water-dispersible colorant;
- 20 - 80 weight% water;
- 0 - 75 weight% of a cosolvent;
- 0.01 - 3 weight% of a surfactant;

wherein all amounts are relative to the total ink composition, and wherein the ink composition has a dynamic surface tension of below 35 mN/m and a static surface tension of above 21 mN/m both determined at the operating temperature.

In one aspect, there is provided ink composition, suitable for being ejected from an inkjet marking device at an operating temperature of between 15°C and 50°C, the ink composition comprising:

- 1 - 40 weight% of a water-dispersible resin;
- 0.5 - 15 weight% of a water-dispersible colorant;
- 20 - 80 weight% water;
- 0 - 75 weight% of a cosolvent;
- 0.01 - 3 weight% of a mixture of surfactants comprising at least one surfactant of a first type being an ethoxylated acetylene glycol and at least one surfactant of a second type selected from the group consisting of silicone surfactants and fluorochemical surfactants;

wherein all amounts are relative to the total ink composition, and wherein the ink composition has a dynamic surface tension of below 35 mN/m measured at 10Hz and a static surface tension measured at 0.1Hz of above 21 mN/m both determined at the operating temperature with the bubble pressure method, wherein the amount of the mixture of surfactants is sufficient to obtain said dynamic and static surface tensions.

In the context of the present invention, the dynamic surface tension is defined as the surface tension determined according to the bubble pressure method at a bubble

frequency of 10 Hz. The static surface tension is defined as the surface tension determined at a bubble frequency of 0.1 Hz. See experimental part for details of the bubble pressure method.

The operating temperature (also termed jetting temperature) is defined as the operating temperature of an inkjet marking device adapted to eject (i.e. jet) droplets of an ink composition. The jetting temperature for an aqueous ink composition according to the present invention is preferably between 15°C and 50°C, more preferably between 20°C and 40°C, even more preferably between 25°C and 35°C.

The ink composition may comprise between 0.01 and 3 weight% of a mixture of surfactants comprising at least one surfactant of a first type selected from the group consisting of acetylene glycols and ethoxylated acetylene glycols and at least one surfactant of a second type selected from the group consisting of silicone surfactants and fluorochemical surfactants, with the proviso that if the mixture of surfactants comprises an acetylene glycol and an ethoxylated acetylene glycol, which are both surfactants of the first type, the presence of the at least one surfactant of the second type in the mixture of surfactants is optional. The mixture of surfactants may thus consist of an acetylene glycol and an ethoxylated acetylene glycol.

Therefore the present ~~invention pertains to~~disclosure also discloses an ink composition, suitable for being ejected from an inkjet marking device at an operating temperature of between 15°C and 50°C, the ink composition comprising:

- 1 - 40 weight% of a water-dispersible resin;
- 0.5 - 15 weight% of a water-dispersible colorant;
- 20 - 80 weight% water;
- 0 - 75 weight% of a cosolvent;
- 0.01 - 3 weight% of a mixture of surfactants, comprising at least one surfactant of a first type selected from the group consisting of acetylene glycols and ethoxylated acetylene glycols and at least one surfactant of a second type selected from the group consisting of silicone surfactants and fluorochemical surfactants, with the proviso that if the mixture of surfactants comprises an acetylene glycol and an ethoxylated acetylene glycol, which are both surfactants of the first type, the presence of the at least one surfactant of the second type in the mixture of surfactants is optional;

wherein all amounts are relative to the total ink composition, and wherein the ink composition has a dynamic surface tension of below 35 mN/m measured at 10Hz and a static surface tension measured at 0.1Hz of above 21 mN/m both determined at the operating temperature with the bubble pressure method, wherein the amount of the mixture of surfactants is sufficient to obtain said dynamic and static surface tensions.

In an ~~embodiment~~example, the surfactant of the first type is selected from the group consisting of acetylene glycols and ethoxylated acetylene glycols and the surfactant of the second type is selected from the group consisting of silicone surfactants and fluorochemical surfactants.

In an example~~embodiment~~, the surfactant of the first type is an ethoxylated acetylene glycol and the surfactant of the second type is selected from the group consisting of silicone surfactants and fluorochemical surfactants.

In an example~~embodiment~~, the surfactant of the first type is an ethoxylated acetylene glycol and the surfactant of the second type is a silicone surfactant, preferably a siloxane surfactant, more preferably an ethoxylated siloxane surfactant.

In an example~~embodiment~~, the surfactant of the first type is an ethoxylated acetylene glycol and the surfactant of the second type is a fluorochemical surfactant.

In an example~~embodiment~~, the mixture of surfactants additionally comprises a surfactant of a third type, in particular a dialkyl sulfosuccinate salt, such as sodium dioctyl sulfosuccinate (AOT).

The required dotgain for avoiding or at least mitigating streakiness in a print can be empirically determined. For example in a single pass 600 dpi inkjet printing process, it has been empirically determined that a dot size (ink dots on a receiving medium) of at least 75 μm is required to avoid or at least mitigate streakiness in the halftone prints on machine coated or offset coated media. Using an inkjet printhead jetting 10 pl droplets (droplet diameter of 26,7 μm)a dotgain of 2.8 (minimum dotsize of 75 μm divided by the droplet diameter of 26.7 μm results in a required dotgain of 2.8) or higher is thus required.

The dotgain depends on the type of receiving medium and dynamic surface tension of the ink. The dotgain of an ink composition may vary a lot depending on the media type; hence different media may require differently tuned ink compositions.

Inventors have surprisingly found that the dynamic surface tension of an ink composition measured at a frequency of 10 Hz (i.e. contact times of 0.1 s) correlates very well with dotgain. Inventors have also found that a dotgain of 2.8 or more on a wide range of media can be obtained by an ink composition having a dynamic surface tension at 10 Hz of below 35 mN/m, preferably below 34 mN/m, more preferably below 33 mN/m, even more preferably below 32 mN/m measured at 10 Hz. by optimization of the cosolvent composition and the surfactant composition comprised in the latex ink composition.

A static surface tension of below 21 mN/m of the ink composition according to the present invention may cause wetting of the of the nozzle plate, in particular the outer surface of the nozzle plate adjacent to the nozzle (in other words the nozzle region). Wetting of the nozzle region may cause deterioration of the jetting properties of the inkjet marking device. In particular the jet angle may increase (skewness) and become unstable (e.g. fluctuating jet angle during operation). In a single pass (high speed) printing process is it very difficult to compensate for askew jetting nozzles, in particular when the skewness varies during printing.
It is therefore an additional advantage of the ink composition according to the present invention is that due to the fact that the static surface tension of the ink composition is above 21 mN/m, preferably above 22 mN/m, more preferably above 23 mN/m, even more preferably above 24 mN/m, the above problem is solved or at least mitigated.

In an ~~example~~embodiment, the ink composition has a static surface tension of below 30 mN/m, preferably below 29 mN/m, more preferably below 27 mN/m, measured at 0.1 Hz.

The static (i.e. measured at 0.1 Hz) and dynamic (i.e. measured at 10 Hz) surface tension of the ink composition may be tuned by suitably selecting one or more cosolvents in combination with one or more surfactants as listed below.