Mottling in offset printing

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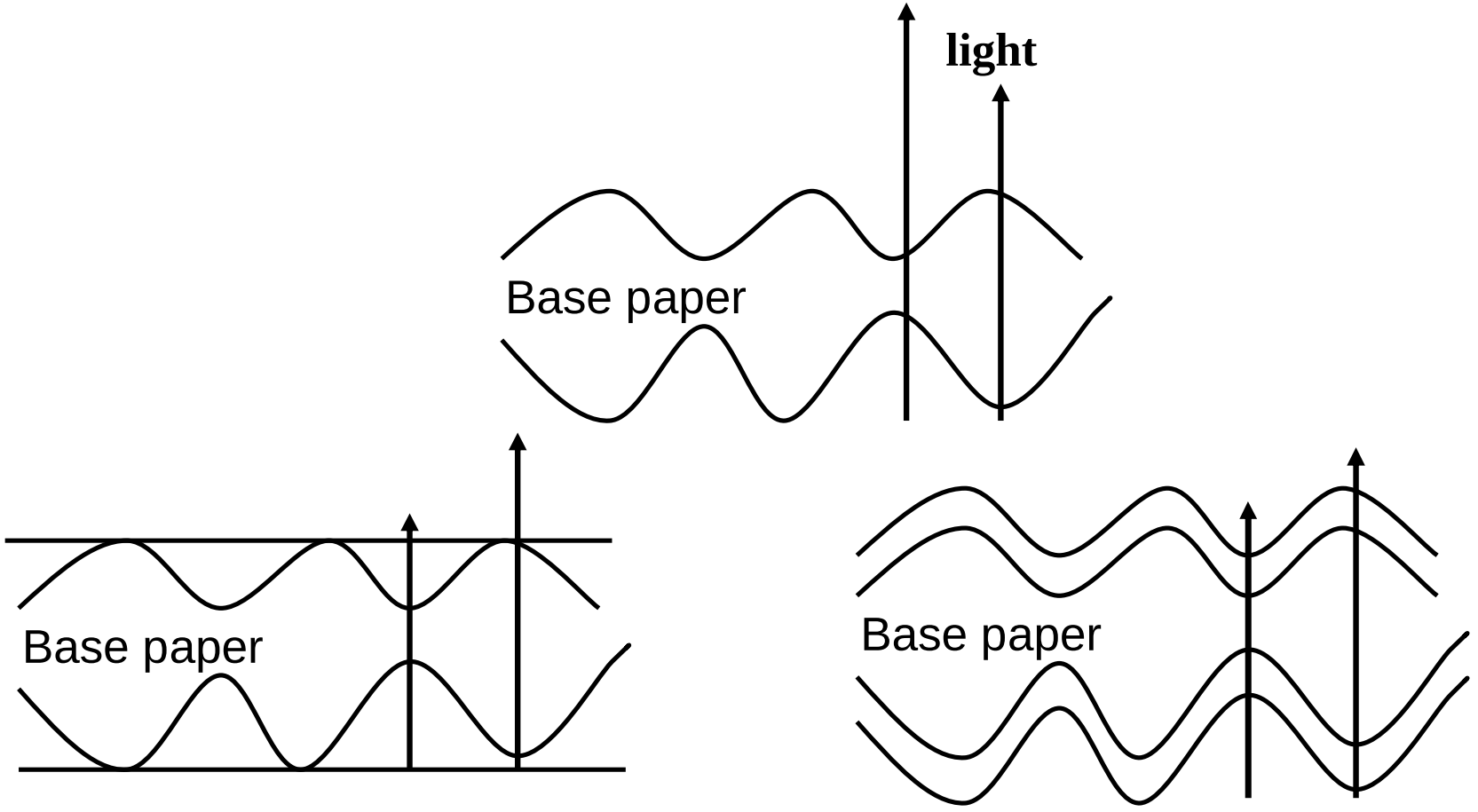
Outline

- **General mottling types of coated paper**
  - Opacity mottling
  - Brightness mottling
  - Gloss mottling
- **Offset related mottling types**
  - Back trap mottling
  - Water repellence mottling

Mottling

- mottling is unwanted uneven print density and color variations
  - spotty and cloudy appearance
  - graininess – size of unevenness < 1 mm
  - mottling normally from 3 to 15 mm
- mottling results normally from paper's uneven:
  - Optical properties
  - Absorption properties
  - Chemical properties

Opacity and brightness mottling
(coated paper)



Stiff blade coated

Contour coated (Film press)

Opacity and brightness mottling
(coated paper)

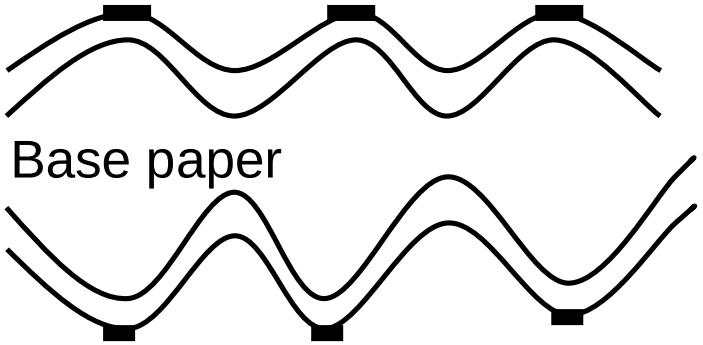
- Uneven formation of base paper
  - Uneven coating amount (blade coating)
  - Coating color has typically better optical properties than base paper
  - > Uneven brightness
    - Mottling especially in light tone area (contrast variations)
  - > Uneven opacity
    - Mottling especially in light tone area; backside dark full tone (uneven show through; “dirtiness”)

How to reduce opacity and brightness mottling?

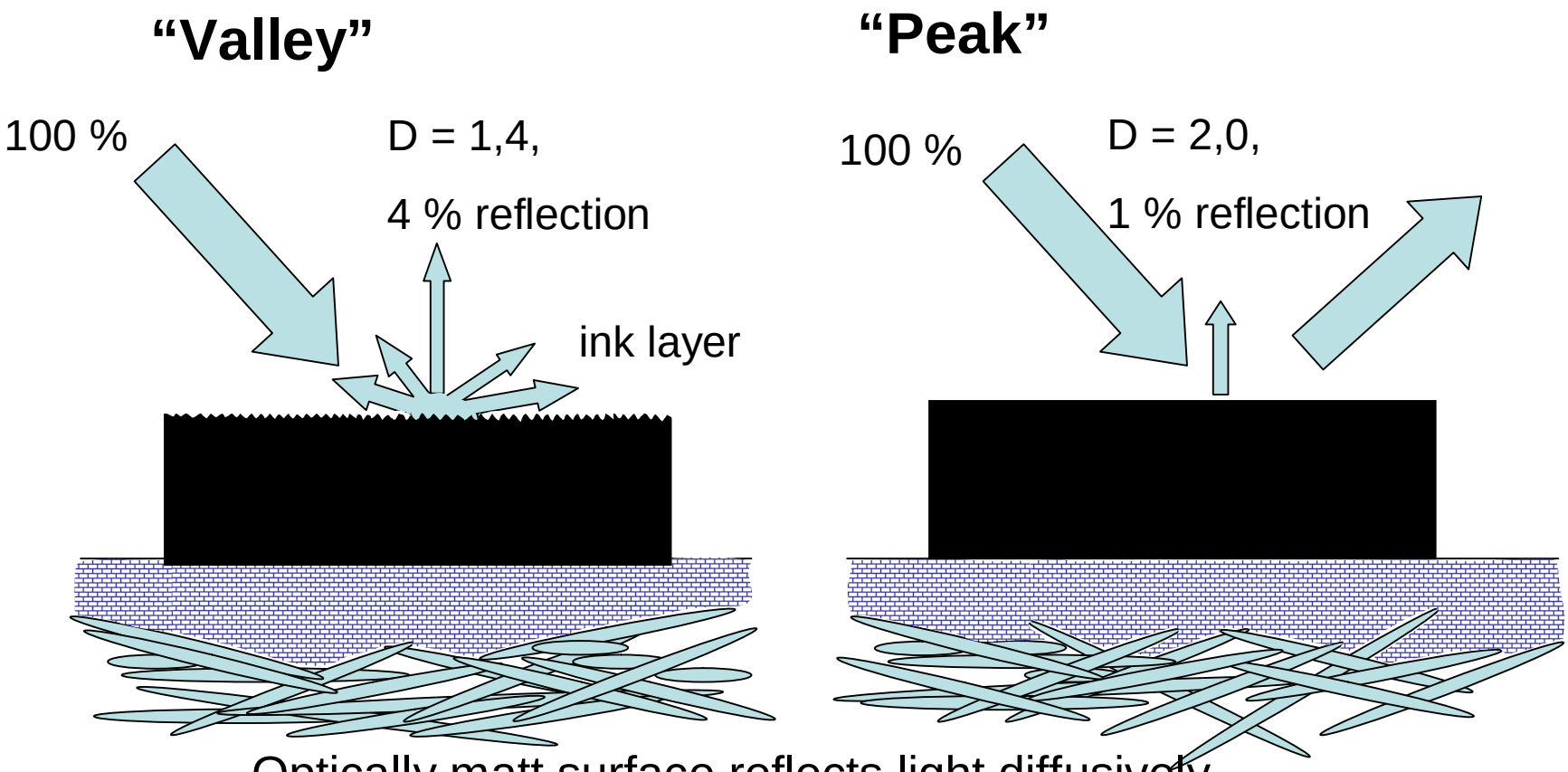
- Improve base paper formation
- Use contour coating
- Improve base paper optical properties
- Reduce coating layer optical properties

Gloss mottling

- Uneven base paper formation
- Contour coating
  - Uneven paper thickness
- Calendering
  - Uneven gloss
    - Peaks: high gloss
    - Valleys: low gloss
  - Uneven print gloss
  - Uneven density
  - >mottling



Print density and gloss



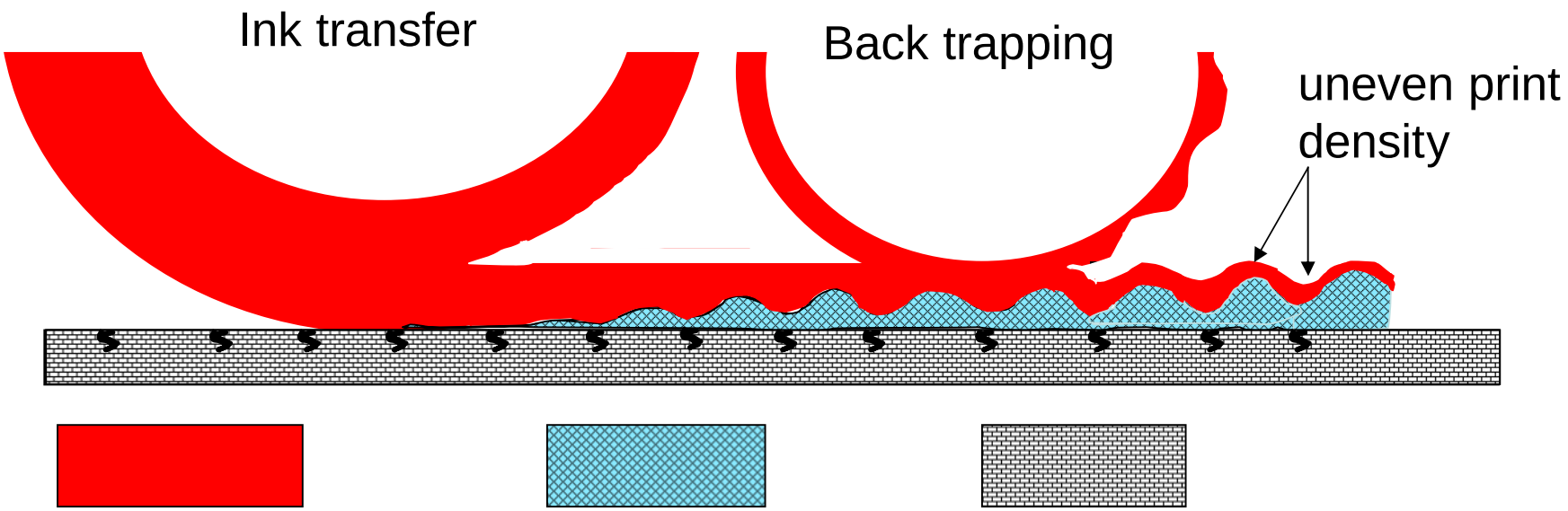
Optically matt surface reflects light diffusively

ð low print density even with thick ink films

Offset related mottling

Back-trap mottling

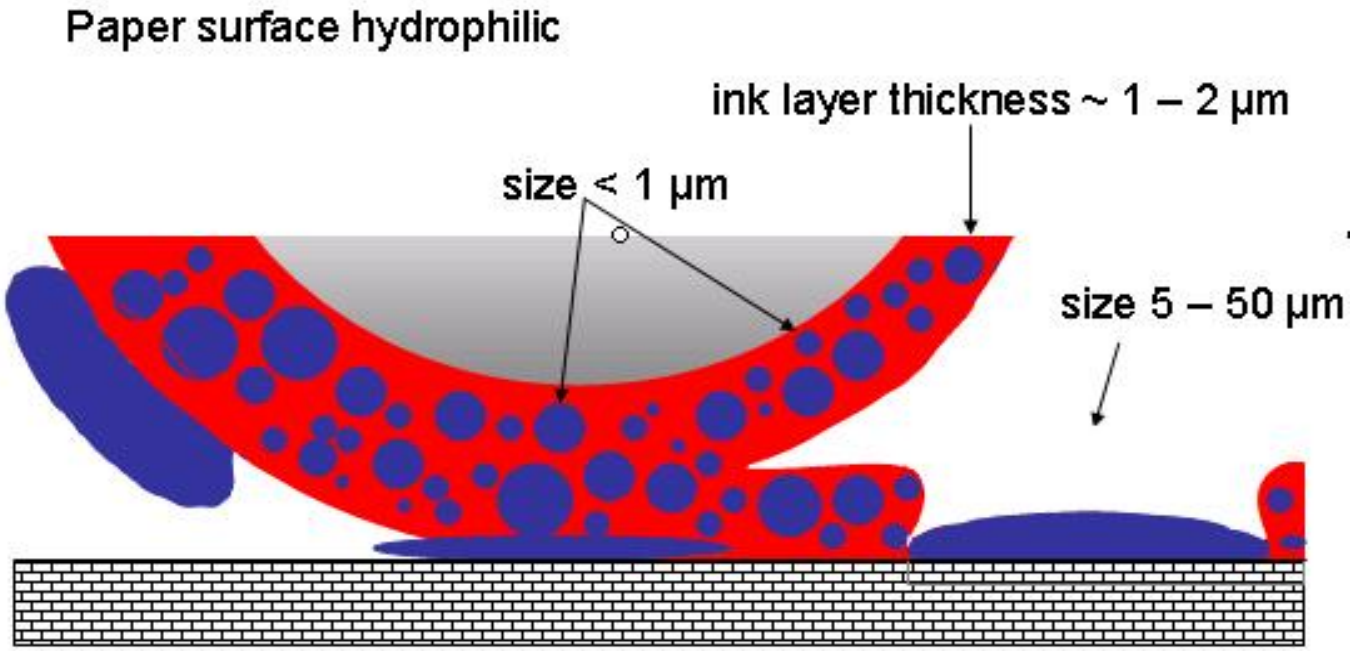
1) Coating layer porosity uneven
2) Ink layer splits in the middle of unset ink layer



Factors affecting back-trap mottling

- Uneven ink setting
  - Printing speed
    - Decreases or increases mottling
  - Ink setting speed
    - Uneven capillary absorption of paper
    - Ink's setting speed
    - (Fountain solution and ink feed)
- Number of back-trappings
  - Ink sequence – decrease number of back-trappings with difficult inks (Cyan vs. Magenta)

Wet repellence mottling

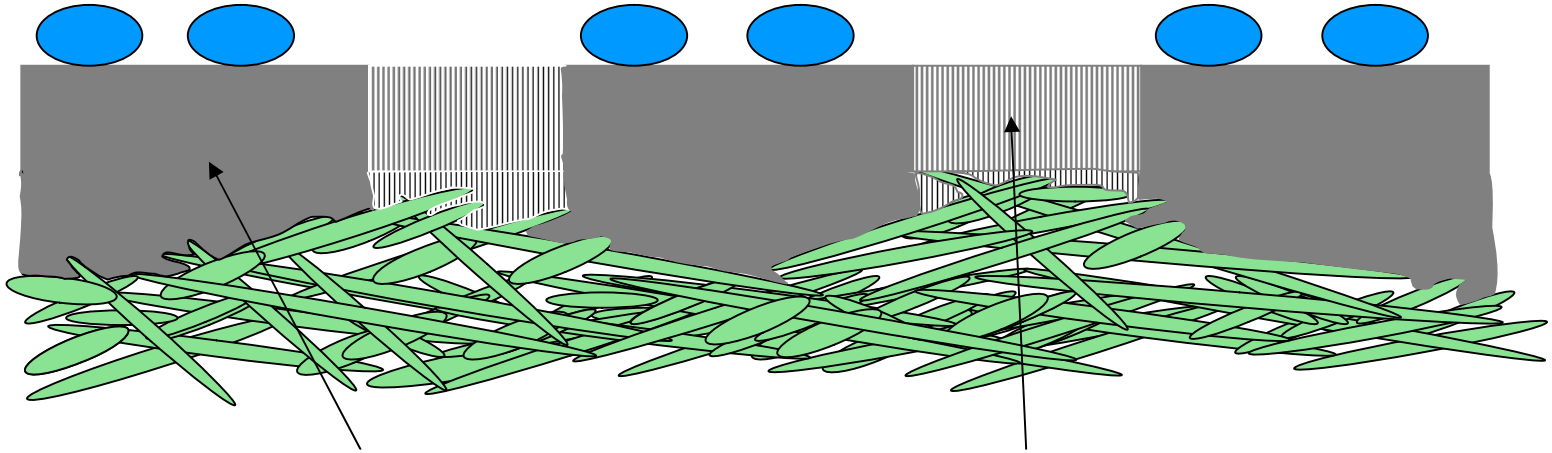


Mechanism: water form a film on paper surface which repels ink transfer

- water from previous units or surface water over ink
- coating layer is dense and hydrophilic

Hydrophobic, uneven porosity

hydrophobic surface = no ink trapping problem



Printing variables affecting wet repellence mottling

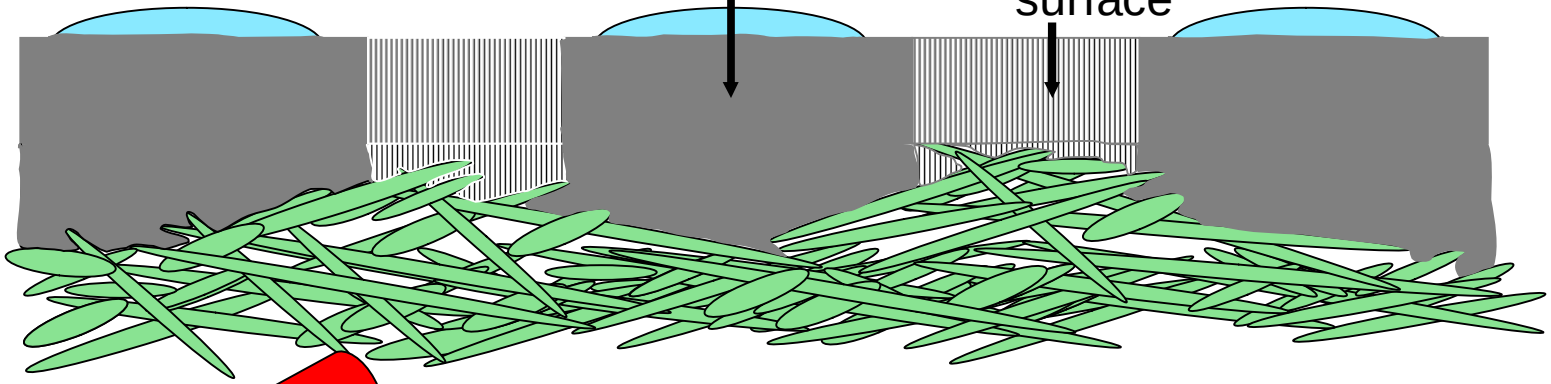
- Printing press
  - Higher printing pressure removes repelling water film on paper
  - Decreased printing speed
- Fountain solution and ink
  - Lower water feed
  - Increased ink emulsification capacity
- Paper
  - Decreased hydrophilicity and/or increased porosity

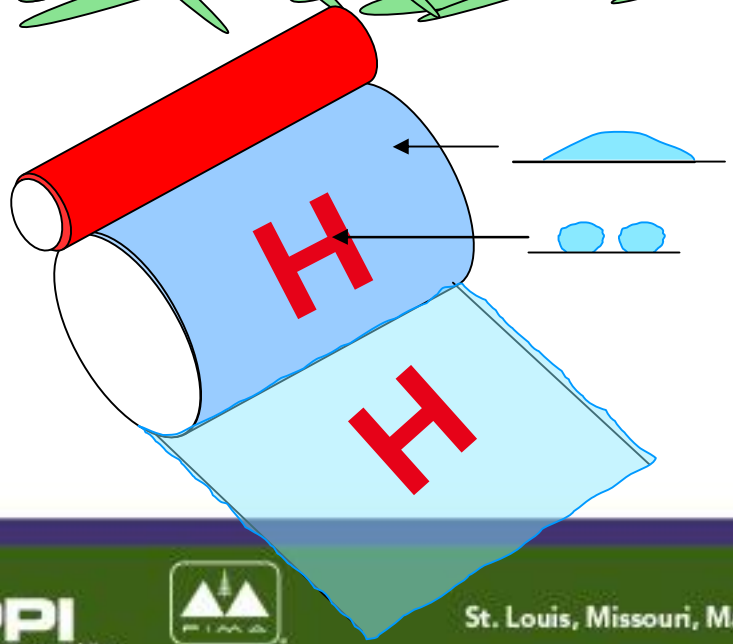
Hydrophilic, uneven porosity

Hydrophilic surface = wet repellence

closed coating surface → **Water mottling**

porous coating surface → **Back-trap mottling**





Wet repellence on hydrophilic area

Good ink transfer on hydrophobic area

Paper should be rather oil loving for good ink transfer