

TO : LG MICRON CO.,LTD

How to control the developer sludge

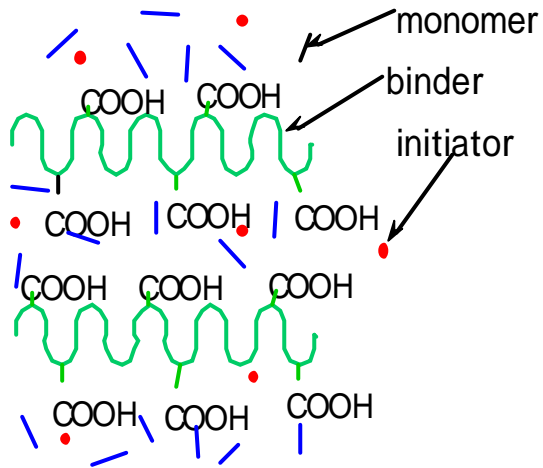
May. 1st 2008

AsahiKASEI
ASAHI KASEI EMD

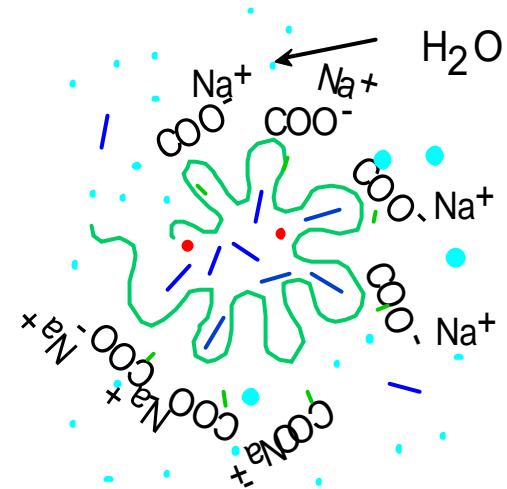
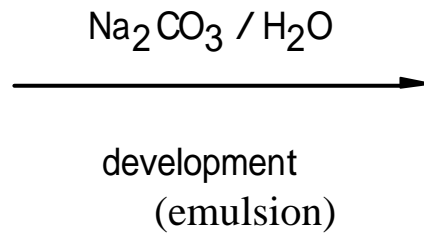
Electronics Interconnecting Materials Technology & Development Dept.

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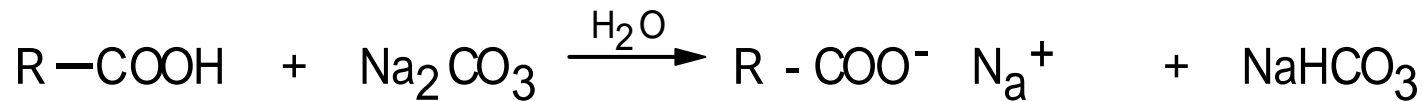
Mechanism of DFR Development



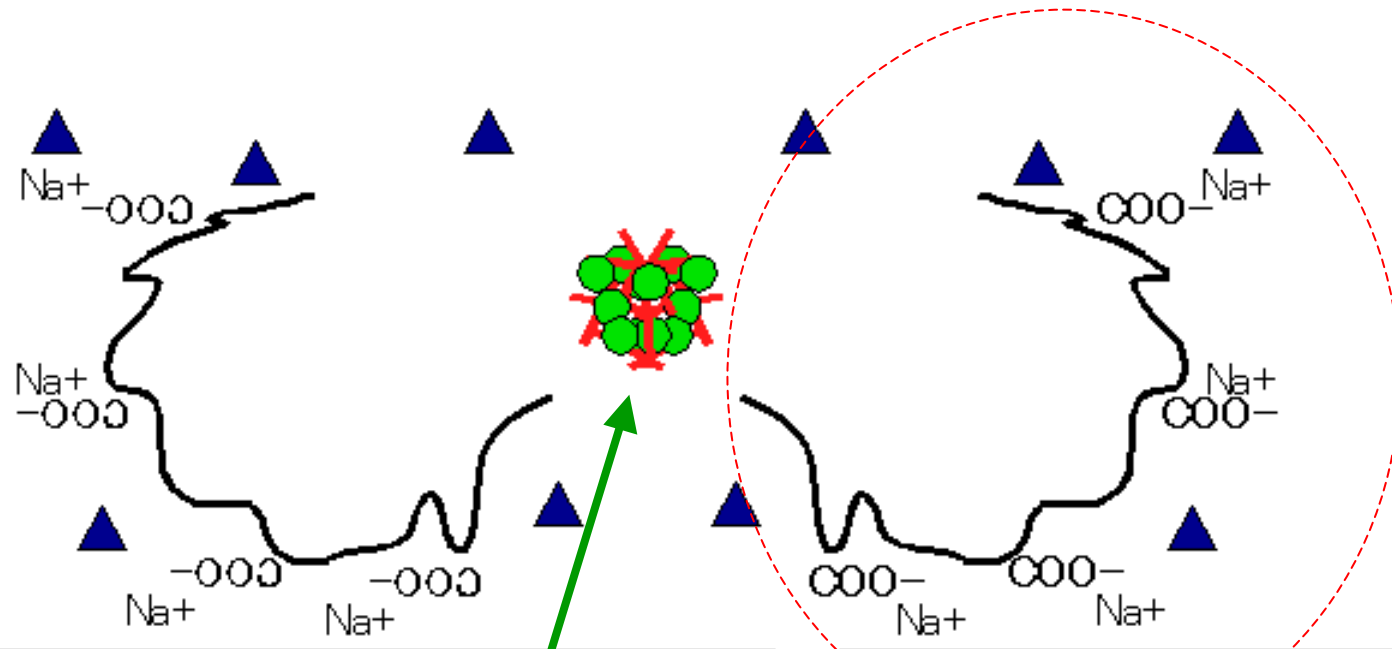
Three main components of DFR
(unexposed area)



Three main components of DFR
(In the developer)



Developer sludge (scum)



Monomer, initiator, plasticizer, dye
Hydrophobic

Polymer = Hydrophilic
Because of having **-COOH** group

→ Once coming out in developer, Hydrophobic components cohere,
then become “**developer sludge**”.

How to reduce sludge



To reduce sludge

1. DF dissolved loading
2. Water quality
3. Defoamer type
4. Periodical cleaning
5. Filter mesh size
6. Shield UV light
7. Exclusive developing process

Emulsion broken hydrophobic components appear! sludge

To reduce (minimize) developer sludge(1)

1. DFR dissolved loading control

If there are so much emulsion in developer, each emulsion **crashes** easily. → emulsion broken → sludge

Recommendation: **0.40m²/L** for 25um DFR

0.20m²/L (50um), 0.33m²/L (30um), 0.50m²/L (20um)

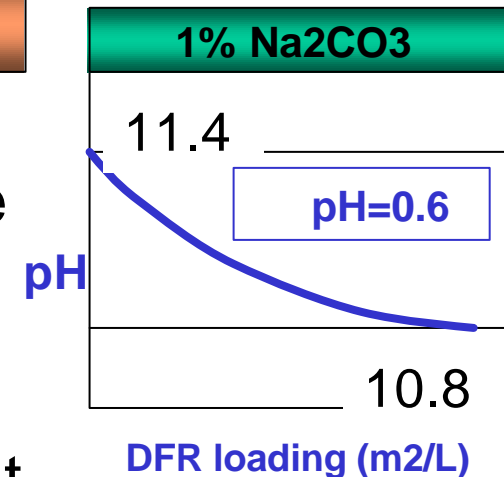
<How to control?>

1) **Panel counter** in developer machine

2) **pH control**

3) 電位差計

1), 2) are very common and convenient.



To reduce (minimize) developer sludge(2)

2. Water Quality

- Purified and DI water are recommended.

City water includes some ions (Cl⁻, Mg²⁺, Ca²⁺ etc.) and Si compounds.

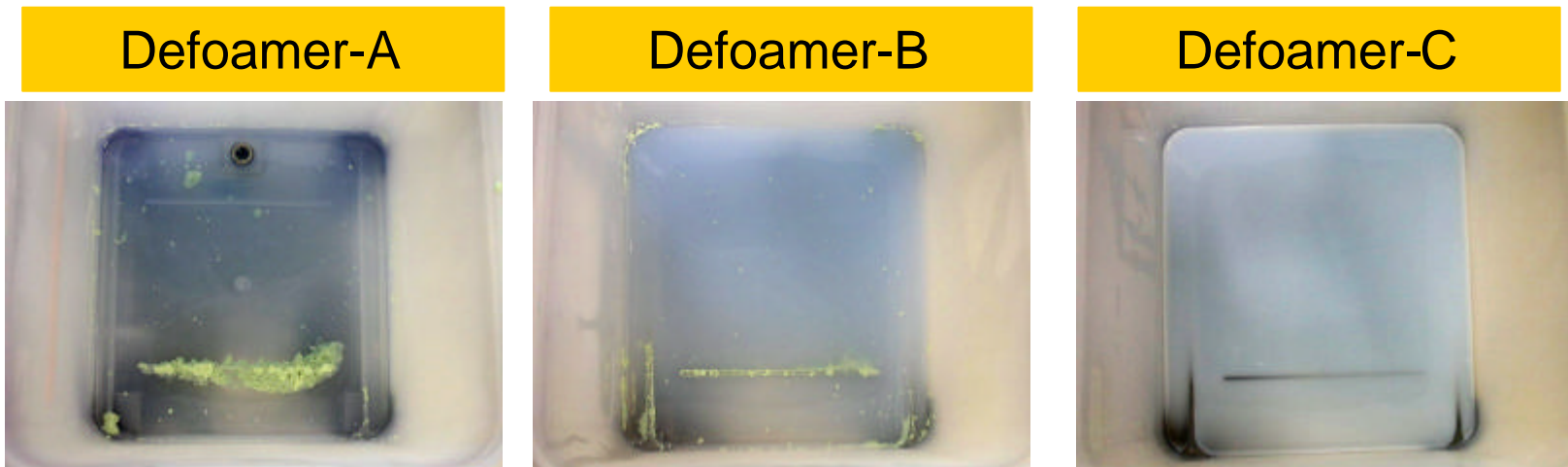
→ Organic sludge came from DF and MgCO₃, CaCO₃ crystal on conveyor roller and air knives area

Short defect (subtractive process)

Open defect damaged by "hard crystal"

To reduce (minimize) developer sludge(3)

3. Defoamer type



Defoamer (anti-foam) acts both “defoam” & stabilizer of developer emulsion.

→ AQ Defoamer 203 (Asahi) has compatibility with SUNFORT.

To reduce (minimize) developer sludge(4)

4. Periodical Cleaning

every	Day or Shift	Monthly	Yearly (or half year)
Item to clean	a) squeezing sponge-roller b) high-pressured water in chamber	a)+b)+ c) 3-5% NaOH wash Check sludge on conveyor roll	a)+b)+c)+ d) wash by commercial cleaner or acetic acid (CH ₃ COOH冰醋酸(=冰酢酸))

Wash by
acetic acid
Before → After



To reduce (minimize) developer sludge(5)

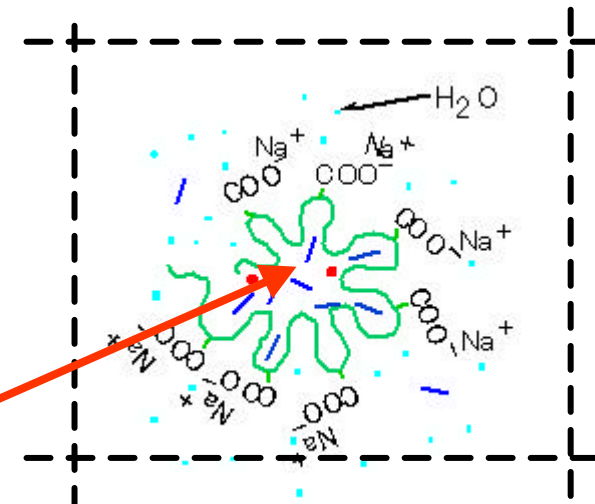
5. Filter size

More than 20 ~ 50um is recommended.

→ Developer emulsion is about 50um.

If 5um or 10um filter is installed, emulsion is prone to be broken easily.

Gathered Emulsion diameter: about 20 ~ 50um



Inside of binder polymer (Polymer: 親水性物質)

→ 疎水性物質 (Monomer, initiator, plasticizer, dye etc.)

→ If broken, 疎水性物質 come out. → We can see “Sludge”.

To reduce (minimize) developer sludge(6)

6. Shield UV light

- Developer dissolved DF should apart from UV light.

→ Developer room & inside of chamber: **yellow light(黄色荧光灯)**

When developer (+DF) expose **UV-light**, polymerization start and make “blue solid foreign material”.

If there is **blue material** in chamber, be careful for short defect (by subtractive process).

To reduce (minimize) developer sludge(7)

7. Exclusive developing process for SAP-DF

In the case of using DF for semi-additive process, introducing special developing machine used for only SAP-DF is desirable.

Mixing several kind of DF sometimes causes increase of sludge because of the compatibility.

It is very important to look well the compatibility of SAP-DF with other DF in advance.