Determination of Total Iron in Eastman Color Films, Process ECN-2, “ML” Type Bleach Using HACH Calorimeter Test Kit

**ECN-2-ML-3280**

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**INTRODUCTION**

This test kit (MACH catalog no. 41100-10) is used to determine total iron in Kodak Color Films, Process ECN-2, “ML” type bleach samples. The bleach samples are diluted and mixed with a FerroVer Iron Reagent Powder Pillow to create a colored solution. This colored solution is measured using the HACH DR 100 Colorimeter provided with the test kit. The absorbance is then used to calculate the amount of iron in the bleach.

This method requires handling potentially hazardous chemicals. Consult the Material Safety Data Sheet for each chemical before use. MSDS’s are available from your chemical supplier.

**RELIABILITY**

The reliability data given below applies only to ECN-2 “ML” Bleach. No calibration was performed using ECN-2 “UL” Bleach.

Three fresh mixes of Process ECN-2, “ML” Bleach (5.0, 10.0, 15.0 g/L total iron) were analyzed in duplicate on one day by three Kodak processing machine operators. A pooled standard deviation (1s) of 0.39 g/L (n = 16) was calculated. The 95 percent confidence estimate, based on the pooled standard deviation, was ± 1.00 g/L. A high bias of 12.5 percent, 9.0 percent and 7.6 percent were found at the low, aim and high levels, respectively.

A seasoned bleach sample analyzed to be 3.94 g/L total iron, and a standard addition to that sample of 2.09 g/L iron (added as solution 3422), were analyzed in the same manner as the fresh samples. For the seasoned samples, the standard deviation (1s) was 0.13 g/L (n = 5) and the 95 percent confidence estimate was ± 0.36 g/L. Recovery was 97 percent.

**APPARATUS**

Use pipets and volumetric glassware meeting the “Class A” definition by the National Institute of Standards and Technology (NIST).

- 500-mL volumetric flasks
- 5.0-mL pipets

The following are provided with the HACH test kit:

- 2.5-cm sample cells
- Clippers
- 1-cm cell holder
- HACH DR-100 Colorimeter

**REAGENTS**

All reagents are provided with the HACH test kit.

- FerroVer Iron Reagent Powder Pillow
PROCEDURE*

1. Pipet 5.0 mL of bleach sample into a 500-mL volumetric flask. Dilute to volume with distilled water. Invert six times to mix.

2. Pipet 5.0 mL of the solution contained in the 500-mL volumetric flask (prepared in step 1) into another 500-mL volumetric flask. Dilute to volume with distilled water. Invert six times to mix.

3. Rinse both of the 2.5-cm sample cells using the solution prepared in step 2.

4. Fill one of the sample cells to the 10-mL mark (white line) with the solution prepared in step 2.

5. Use the clippers to open one FerroVer Iron Reagent Powder Pillow and add its contents to the sample cell from step 4. Cap the cell and shake to mix. (An orange color will develop if iron is present.)

Note: After preparation of the sample in step 5, the remaining steps of this procedure must be performed within 30 minutes.

6. Open the Light Shield (black lid) of the DR 100 Colorimeter and turn the Right Set control knob fully clockwise.

7. Place the black plastic 1-cm Cell Holder into the Left Set position of the sample well by aligning the white line of the cell holder with the white line of the Left Set position.

8. Press down firmly to seat the Cell Holder into place. Close the Light Shield.

9. While holding the On button down, adjust the Left Set control to align the meter needle with the arrow at the far left of the scale arc.

10. Open the Light Shield and remove the Cell Holder.

11. Fill the other sample cell from step 3 to the 10-mL mark (white line) with the solution from step 2.

12. Cap the sample cell. Wipe the outside of the cell with a clean tissue.

13. Place the cell into the sample well and press down firmly to seat it into place.

14. Close the Light Shield. While holding the On button down, adjust the Right Set control for a reading of zero mg/L.

15. Open the Light Shield and remove the cell.

16. Wipe the outside of the sample cell prepared in step 5 with a clean tissue.

17. Place the sample cell into the sample well and press down firmly to seat it into place.

18. Close the Light Shield. While holding the On button down, allow the meter reading to stabilize. Read and record the mg/L iron from the 0-2 mg/L scale (bottom scale).

19. Open the Light Shield and remove the sample cell.

20. Multiply the mg/L iron (Fe) reading (obtained in step 18) by 10 to obtain the iron content of the sample in g/L:

\[ \text{g/L iron} = \frac{\text{(reading in mg/L iron)}}{1000 \text{ mg/g}} \]

Where:

\[ \text{g/L iron} = \frac{\text{(reading in mg/L iron)}}{10} \]

Example: \[ \text{g/L iron} = (0.55)(10) \]
\[ \text{g/L iron} = 5.5 \text{ g/L} \]

* Test instructions are adapted from DR 100 Colorimeter Manual (1987) of HACH COMPANY, Loveland, Colorado with the exception of steps 1, 2, and 20.