



## ENTHONE CR288 COPPER PLATING MONITORING SOLUTIONS

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### Overview

The test results of measuring Entegris' Enthone ViaForm® copper (Cu) plating chemistry data demonstrate that CR288, with its index of refraction (IoR) technology, measures the copper dilutions within Enthone to ( $\pm 0.03$  g/L). CR288 is therefore a viable and less costly alternative to near infrared (NIR) technology for monitoring production chemistry during copper plating.

### Introduction

The blending and consumption rate of copper plating chemistry affects product yield and chemical costs. Current technologies, including NIR, do not satisfy the industry's escalating needs for tighter process control and waste reduction. What is needed is a monitoring tool for liquid chemistry that meets these criteria:

- Precisely monitors chemical in real time as it is being consumed
- Detects blending errors and tool errors
- Detects need for resupply of chemistry
- Supports tool cost reduction initiatives by replacing high-cost near infrared (NIR) technology

Entegris' InVue™ CR288 measures fluid concentration while calculating and displaying the results in real time. It detects chemical blending, tool errors, and when chemical resupply is needed. CR288's IoR technology measures liquids at a high level of precision and at a lower cost than NIR.

### Testing and Results

The study evaluated the concept and feasibility of using InVue's CR288 IoR technology to measure dilutions of Entegris' Enthone ViaForm Cu plating chemistry. The study focused on developing a sensitivity curve for the Cu dilution using the IoR.

Enthone Virgin Makeup Solution (VMS) includes:

- $\text{CuSO}_4$
- HCl
- $\text{H}_2\text{SO}_4$
- DIW

The container started with 500 mL of 1:1.5 Enthone VMS:DIW solution (sample 1) in a recirculation loop at room temperature. The solution was spiked with DIW according to the ratio schedule (Table 1). The CR288 Connect data logger recorded the refractive index data.

TABLE 1. VMS:DIW RATIO SCHEDULE.

Sample	DIW Dilution
1	1.5
2	3
3	5
4	7
5	8
6	10

## Analyzed Results/Data

- Plotting the IoR versus dilution ratio shows that CR288 can measure the wide range of DIW dilutions
- CR288 plots the actual dilution fraction of the Enthone VMS in DIW by solving for the dilution equation ( $C_1V_1 = C_2V_2$ )
- Slope noise analysis from the dilution fraction plot showed the minimum resolution as 0.075%

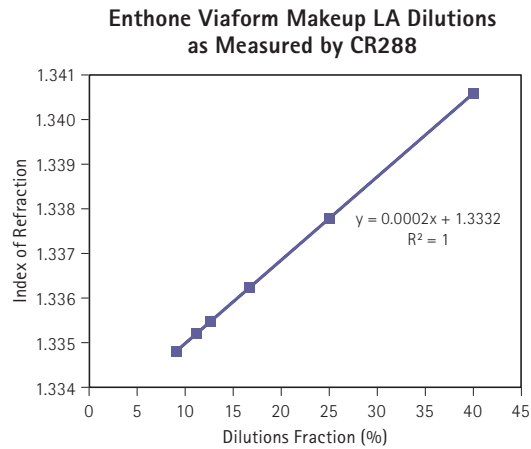


Figure 1. Dilution fraction of Enthone.

The Cu concentration in g/L was calculated from the dilution fraction, with the starting Cu concentration of 40 g/L.

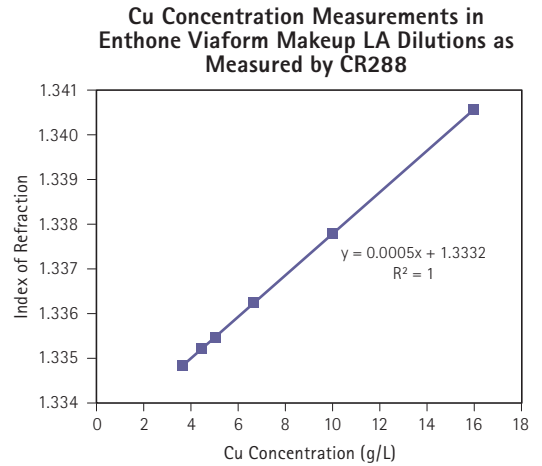


Figure 2. Copper concentration resulting from dilution.

## Conclusion/Summary

The results of the Index of Refraction versus copper dilutions demonstrate that the CR288 measures the copper dilutions within Enthone to a high degree ( $\pm 0.03$  g/L). Entegris' CR288 can be implemented at a lower investment cost than metrology using NIR.