

CLAIMS

1. A method of evaluating whether additives in an electroplating bath of interest meet an electroplating specification, the method comprising:

performing a first experiment by:

contacting an electrode with the electroplating bath of interest,

applying a current density waveform to the electrode, wherein the current density waveform applied approximates a current density experienced in a field region of a substrate when electroplated in the electroplating bath of interest, and

recording a first potential trace output during the first experiment;

performing a second experiment by:

contacting a second electrode with an acceleration solution comprising accelerator until the second electrode is substantially fully accelerated,

rinsing the acceleration solution from the second electrode,

contacting the second electrode with the electroplating bath of interest,

applying a second current density waveform or a potential waveform to the second electrode, wherein the second current density waveform or potential waveform approximates the current density or potential experienced within a feature on the substrate when electroplated in the electroplating bath of interest,

where a second current density waveform is applied, recording a second potential trace output during the second experiment, and where a potential waveform is applied to the second electrode, recording a current trace output during the second experiment; and

determining, based on two or more parameters selected from the group consisting of the first potential trace output, the second potential trace output, the current trace output, and

calibration data, whether the additives in the electroplating bath of interest meet the electroplating specification.

2. The method of claim 1, wherein the electroplating specification relates to the capability of the additives in the electroplating bath of interest to fully fill the feature on the substrate through a bottom-up mechanism in an acceptable timeframe.
3. The method of claim 1, wherein the current density waveform applied during the first experiment corresponds to a current density waveform used for electroplating material on the substrate in a target filling process.
4. The method of claim 3, wherein the current density waveform applied during the first experiment corresponds to a current density waveform used for electroplating material on the substrate in a target filling process, as modified by a field current density correction factor.
5. The method of claim 3, wherein a rotation rate of the second electrode during the second experiment is higher than a rotation rate of the substrate during the target filling process.
6. The method of claim 3, wherein a temperature of the electroplating bath of interest during the second experiment is higher than a temperature of the electroplating bath of interest during the target filling process.
7. The method of claim 1, wherein the first potential trace output from the first experiment is used to select the potential waveform applied in the second experiment.
8. The method of claim 7, wherein the potential waveform is selected based on the potential experienced during a final period of electroplating during the first experiment.
9. The method of claim 8, wherein the potential waveform is selected based on an average potential of the first potential trace output during a final period of electroplating during the first experiment.
10. The method of claim 7, wherein the first potential trace output from the first experiment is used to calculate a predicted potential, the predicted potential corresponding to a potential that would be experienced if electroplating were to continue after a final

(e) determining, based on information contained in one or more of the outputs, whether the additives of the electroplating bath of interest meet a defined electroplating specification.

23. A method of analyzing an electroplating bath of interest, the method comprising:

(a) applying a current to a first electrode while in contact with the electroplating bath of interest, wherein the first electrode's surface is not substantially fully accelerated;

(b) recording an electrical output of the first electrode produced in response to the applied current;

(c) applying a second current or a potential to a substantially fully accelerated surface of a second electrode while in contact with the electroplating bath of interest,

(d) recording a second electrical output of the second electrode when applying the second current or the potential; and

(e) determining, based on information contained in the outputs, whether the electroplating bath of interest meets a defined electroplating specification.

24. The method of claim 23, wherein the first and second electrodes are the same electrode with different surface metals deposited thereon.