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REPORT ON THE CORROSION PERFORMANCE OF THE SAMPLES PROVIDED BY M/S STEELGUARD

Preamble:

Samples in the sheet form and TMT rods were supplied for testing.

Sheet samples were either pre-coated by Steel Guard nanocoat (SG) or Red oxide (RO).

Pre-coated samples were further coated with Epoxy or Enamel.

Prior to pre-coating all the sheet samples were subjected to thorough surface cleaning.

TMT rods were supplied in three categories.

No treatment or coating (normal TMT)

Normal TMT cleaned and coated with Steel guard (normal coated TMT)

TMT rods cleaned and then coated with Steel guard (clean coated TMT)

Corrosion Technique Followed:

Though MS sheets and TMT rods are exposed to normal environment, for corrosion testing NACE solution was taken which is quite aggressive solution.

Variation of OCP as a function of time of all the samples was measured to find out the overall corroding tendency of the samples.

Accelerated corrosion testing has been undertaken by potential dynamic polarization test using Gamry Instrument.

Standardization time of open circuit voltage (OCV) has been recorded and I_{CORR} and E_{CORR} values have been estimated from the polarization curves by Tafel Extrapolation method.

Results:

OCP and OCV variations are shown in graphs and I_{CORR} and E_{CORR} values have been reported in Table 1.

Table 1

Corrosion results for the samples of TMT bars and sheets

Medium: NACE Solution

Potentiodynamic Electrochemical Test

Tafel Extrapolation Method

Sample	Corrosion rate	E_{CORR}
	I corr(A/cm²)	*E corr(V)vs SCE*
RO+epoxy	1.00E-10	-0.742
RO+enamel	1.29E-10	-0.381
SG+epoxy	2.23E-11	-0.429
SG+enamel	5.00E-11	-0.12
cleaned coated sheet	4.00E-04	-0.741
normal coated tmt	6.67E-06	-0.6
normal tmt	5.19E-04	-0.638
cleaned coated tmt	9.94E-05	-0.636

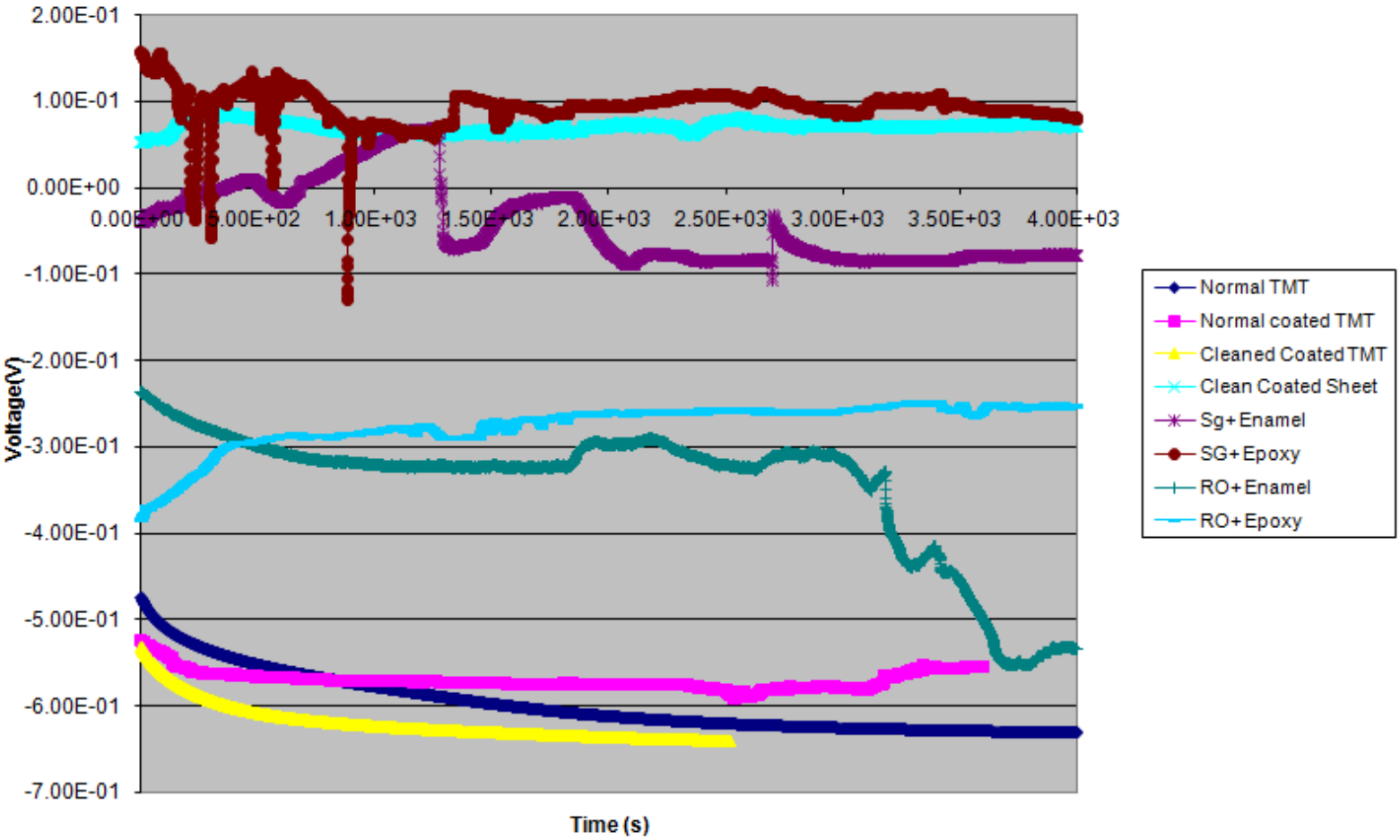
NOTE:
Smaller the I_{CORR} Value and more electropositive the E_{CORR} Value better is the corrosion resistance.

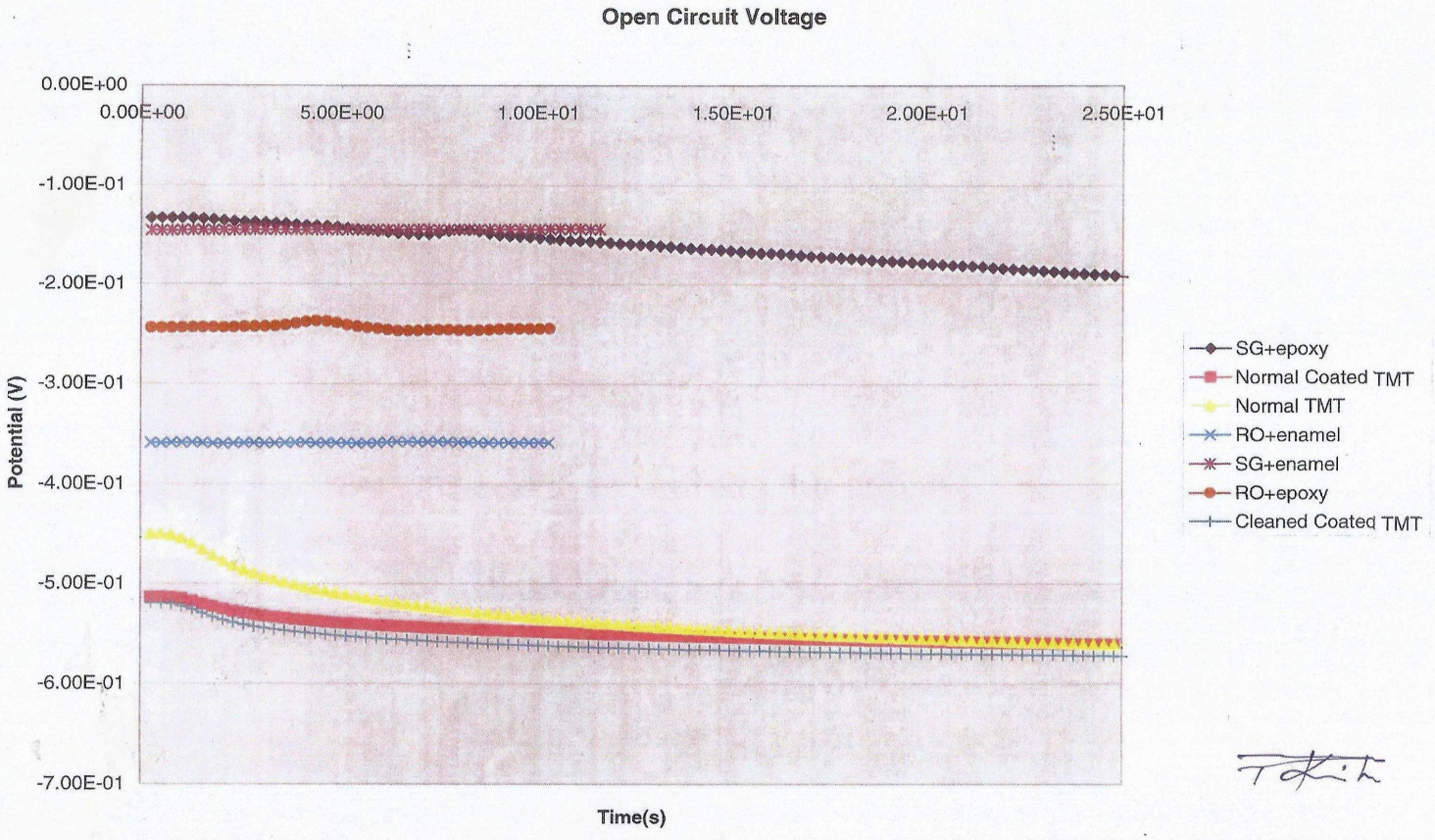
Discussion:
Expectedly pre-coated and further coated sheets give much improved corrosion resistance. Compared to Red oxide pre-coat SG precoated sheets give smaller corrosion rate. E_{CORR} of SG + Enamel is most electropositive so this combination can be considered the best.
Both OCV & OCP variations corroborate the above findings.

As far TMT rods are concerned, normal coated TMT gives the best I_{CORR} and E_{CORR} values, which are further corroborated by OCP variation. However, OCV variation of all the TMT rods is almost same.

Conclusion:
Of all the tested samples Steel Guard nanocoat pre-coating seems to be the best.

Dr. P K Mitra
Professor


2.00E-01
1.00E-01
0.00E+00
-1.00E-01
-2.00E-01
-3.00E-01
-4.00E-01
-5.00E-01
-6.00E-01
-7.00E-01
0.00E+00
5.00E+02
1.00E+03
1.50E+03
2.00E+03
2.50E+03
3.00E+03
3.50E+03
4.00E+03
Voltage(V)
Time (s)
Normal TMT
Normal coated TMT
Cleaned Coated TMT
Clean Coated Sheet
Sg+Enamel
SG+Epoxy
RO+Enamel
RO+Epoxy


Open Circuit Voltage
0.00E+00
-1.00E-01
-2.00E-01
-3.00E-01
-4.00E-01
-5.00E-01
-6.00E-01
-7.00E-01
Potential (V)
0.00E+00
5.00E+00
1.00E+01
1.50E+01
2.00E+01
2.50E+01
Time(s)
SG+epoxy
Normal Coated TMT
Normal TMT
RO+enamel
SG+enamel
RO+epoxy
Cleaned Coated TMT