CONCLUSIONS
The heat and corrosion resistant coatings based on three categories of resins namely silicone (inorganic polymer), CNSL-S (natural polymer) and IPN (synthetic polymer) a blend of the first two have been prepared by incorporating metallic pigments such as zinc, manganese, aluminium and stainless steel. The IPN, which is the condensation product of CNSL-S and silicone is supposed to have good corrosion inhibition as well as heat resistance because of the presence of cross-linking between silicone and CNSL-S polymers. The corrosion resistance performance of the finish coat systems namely ceramic blue and ceramic green pigmented silicone binder separately and as applied over the above mentioned primer undercoats have been evaluated in 3% NaCl medium for mild steel substrate. The heat resistant properties were also measured. The major conclusions drawn from the studies are presented below.

1. The FTIR studies have helped in the characterization of the synthesized binders namely silicone, CNSL-S and IPN. The predominant sulfide group present in the CNSL-S and the Si-O-Si bond in the silicone polymer backbone and the presence of both the groups in the IPN have
been identified through their absorption peaks and appropriate frequencies.

2. The high temperature resistance properties of the above binders have been studied through TGA / DTA, DSC, XRD and SEM analysis. These results along with ASTM specification D-2482 for the pigmented primers lead to the conclusion that their resistance capacities to be arranged in the following order,

Binder : silicone > IPN > CNSL-S
Primer: Aluminium > zinc > manganese > stainless steel
(mostly for all the binders)

3. The Potentiodynamic polarization studies of primers based on the above binders with the various concentrations of PVC have been performed for various exposure periods. From these studies the CPVC of the pigments specific to binder have been fixed. The results being

Silicone Binder : 70% zn, 70% Mn, 20% Al, 40% SS
CNSL-S binder : 70% zn, 60% Mn, 30% Al, 30% SS
IPN binder : 70% zn, 70% Mn, 20% Al, 40% SS

The behaviour of IPN pigmented binder is the same as that of pigmented silicone binder.
4. The corrosion resistance property of the primers is justified in terms of the galvanic current and barrier effect produced by the zinc and manganese pigmented primers. In the case of aluminium and stainless steel pigmented primers the binder wetability and passivation mechanism play a role.

5. The protection ability of the silicone binder with methyl and Si-O-Si group accounts for its very impressive corrosive resistance and heat resistant performance. The sulfide group present in the CNSL-S binder is reason for its fairly good performance. When these two binders are mingled with each other under suitable condition they form a very stable IPN. The performance of the IPN is better than CNSL-S and come closer to silicone, may be due to its crosslinked structure that could impart good binding energy.

6. The most required coating properties namely corrosion and high temperature resistance, mechanical properties etc have been examined for the primers. From the studies it is noted that the CNSL-S binder (organic coating) can replace silicone (inorganic coating) for corrosion resistance and high temperature environment applications to a very limited extent. But still the CNSL-S compound because of its low cost can become a versatile alternative in the manufacture of paints for wide range of applications. In the case of IPN wherein we have only 30% of
silicone content in the blend the requisite properties of the binder is seen to come closer to pure silicone resin which result in a large cost saving effort.

7. Impedance studies have enabled the calculation of charge transfer resistance values and the double layers capacity values of the coatings in NaCl medium for different exposure periods. These values reflect the impressive performance of the coating systems. The shapes of the Nyquist plots suggest the mechanism of the corrosion in presence of the coatings.

8. The SEM studies made after suitable heat treatment procedures as per ASTM Standards confirm the impressive performance of the coated specimen through the absence of any deformation in the coating and suggest the endurance temperature.

9. The studies with the pigmented primers suggest zinc and manganese pigmented primers based on IPN are the best from the corrosion resistance point of view

10. With the pigmented primers in the absence of topcoat from the heat resistance point of view, aluminium and zinc pigmented primers based on IPN are the best.
11. To enhance further the requisite properties we have tried with CG and CB based topcoats. Among the two, CG based topcoats are found to give better results. With the application of CG based topcoats, in the case of zinc pigmented primers, the corrosion resistant property is further enhanced, while the temperature resistance property is enhanced with aluminium pigmented primers.

Thus, from the studies it has become possible to identify some of the good cost effective pigmented primers that could be used with finish coats for further improved corrosion and temperature resistance properties. In this direction IPN has been identified as the best binder to replace silicone resins.