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Field studies on corrosion of mild steel and composition of rust

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Preliminary field studies were carried out at two sites—in a typical marine atmosphere at Mandapam and inland - industrial atmosphere at Madurai to study the relationship of corrosion with composition of rust. Steel specimens were exposed under open and sheltered conditions. Results obtained are presented in this paper. It is observed that corrosion is proportional to chloride or sulphate or moisture content in rust.

Key words: Atmospheric corrosion, chloride, rust

EXPERIMENTAL

Preparation of steel specimens, method of cleaning, method of exposure, removal of corrosion products, determination of monthly corrosion rate were carried out as per standard procedures [1]. Salinity measurements at marine site and sulphur dioxide determinations at industrial site were carried out every month using wet candle method [2] and standard procedures [3]. Meteorological data were collected daily.

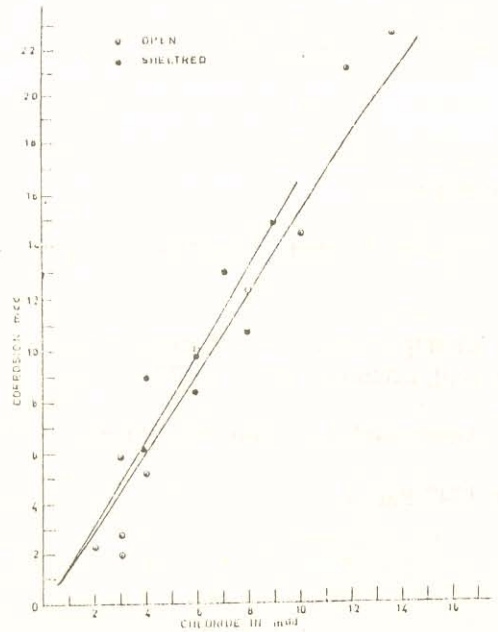

Fig. 1:- Corrosion vs chloride in rust

RESULTS

Marine atmosphere

From Fig. 1, a linear relationship appears to exist between corrosion and soluble chloride in rust. Similarly Fig. 2 shows linearity between corrosion and moisture content.

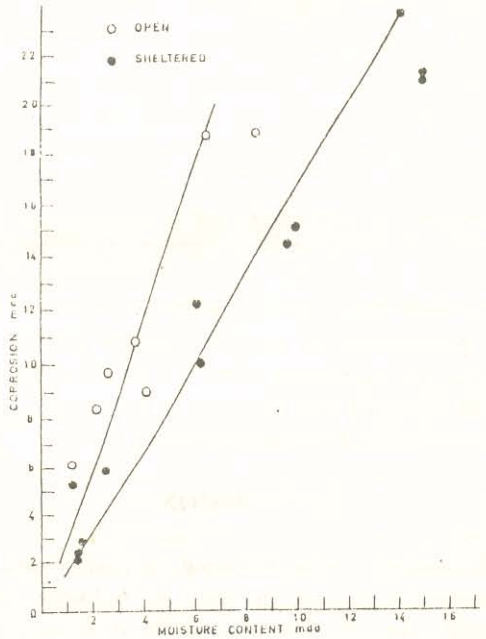

Fig. 2: Corrosion vs moisture content

If the availability of soluble chloride in rust is expressed as a percentage of atmospheric salinity, the maximum value (of 59%) is seen in the month of May in which corrosion and humidity are maximum (Fig. 3).

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Industrial atmospheres

From Fig. 4 it appears that linear relationship exists between corrosion and soluble sulphate in rust under open and sheltered conditions. Similar is the case with corrosion and moisture content (Fig. 5).

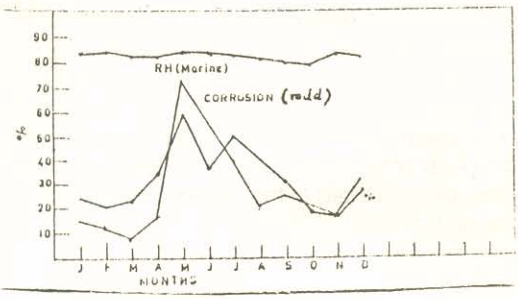

Fig. 3: Chloride in rust as percentage of atmospheric salinity

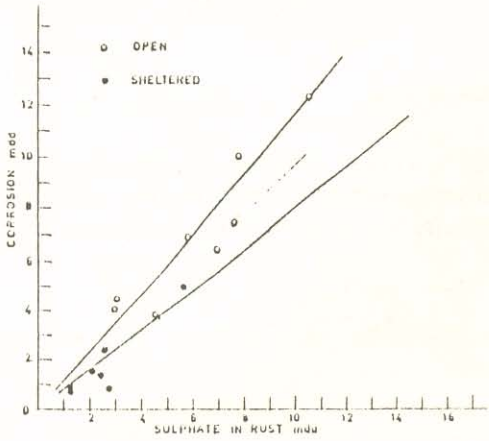

Fig. 4: Corrosion vs sulphate in rust

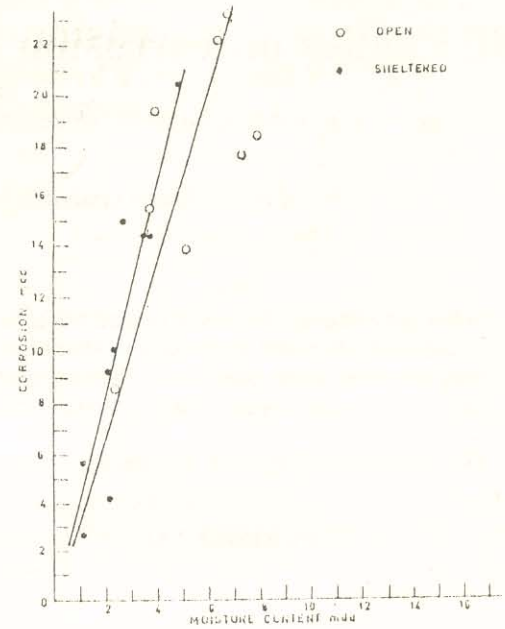

Fig. 5: Corrosion vs moisture content

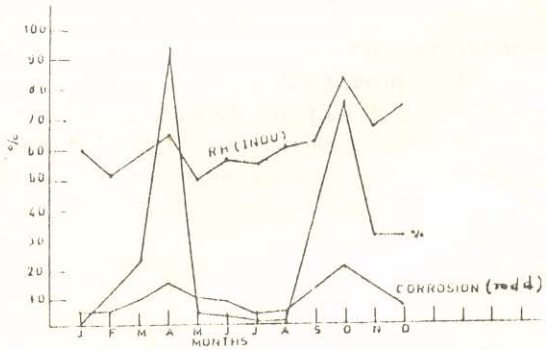

Fig. 6: Sulphate in rust as a percentage of atmospheric sulphate

If the availability of soluble sulphate in rust is worked out as a percentage of sulphur dioxide present in the atmosphere, the maximum value (of 85%) is obtained in the months of April and October in which the corrosion and humidity values are maximum (Fig. 6).

CONCLUSION

Linear relationship exists between corrosion and soluble chloride/sulphate in rust, as well as between corrosion and moisture content. The availability of soluble chloride or sulphate in rust as a percentage of chloride/sulphur dioxide in the atmosphere is greater at higher corrosion and humidity values.

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