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**80 YEARS OF
IMPACT**

Council of Scientific &
Industrial Research

CSIR's *The Wealth of India* Encyclopaedia



THE natural resources of a nation are not only its utmost pride but also its actual wealth. Such resources predominantly comprise economically important plants, animals and minerals. Hence, countries often ensure systematic compilation of the natural wealth of their territory as it helps in planning strategies for development.

When the British occupied this biodiversity-rich country in the late 19th century, they quickly realised the natural wealth of this subcontinent and did a compilation of its fauna and flora. Our visionary Indian leaders, too, were aware of the importance of compiling such invaluable information.

The “*The Wealth of India — Raw Materials Series*” is an internationally acclaimed reference standard for authentic information on Indian economic plants, animals and minerals. *The Wealth of India* plays an important role in protecting our community knowledge of various Indian medicinal plants, animals and minerals.

The origin of *The Wealth of India* dates to the end of the nineteenth century. The starting point is the authoritative six-volume *Dictionary of Economic Products* prepared by George Watt (1851-1931). Watt was a medical graduate of the University of Glasgow who came to India in 1873. Though employed as a surgeon, he assiduously took to studying and collecting economic plants through fieldwork. Ten years later, Watt received official sanction for his hobby when he was asked to organize, during 1883-1884, an exhibition of Indian economic plants at Calcutta. Thus spurred, Watt spent the next 25 years of his life on his monumental dictionary.

During World War II, the British required India's help in their war efforts. It became clear that India's independence would be a mere matter of time after the war ended. India's preparations for its independence had already begun; there was now ever-increasing participation by the Indians in the governance of their own country.

When the Council of Scientific and Industrial Research (CSIR) was set up in 1942, one of the first tasks it took up was the revision and expansion of Watt's Dictionary. The new work would be called *The Wealth of India*. It would not only run a series on raw materials, following Watt, but would also, as befit a new nation, focus on industrial products.

The A to Z of raw materials was covered in 11 volumes (along with two supplements), while the parallel series on ‘Industrial Products’ comprised nine volumes. All these titles were published during 1948-1976. When the first volume on raw materials came out in 1948, it carried a foreword by India's first prime minister and science visionary, Jawaharlal Nehru. He wrote: “*I have no doubt that this book will be of great value to the builders of new India. It should be of value also in educating the average citizen, who should take an interest in this fascinating land and its enormous potentialities*”. Nehru could not have foreseen the extended



interest the series would generate not only in India but also elsewhere.

As it has turned out, it is the raw wealth of India rather than the industrial wealth which has caught the world's eyes. Interest in the natural wealth of India significantly increased in the later years because of the concerted efforts being made the world over to incorporate traditional knowledge systems into the proprietary mainstream.

The Wealth of India is a prized publication that was brought out by the CSIR-National Institute of Science Communication and Information Resources (CSIR-NISCAIR), now known as the CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR).

The First Supplement Series in five volumes was published during 2000-2004, and the Second Supplement Series was published in three volumes during 2006-2009. All these series followed the same style and format as the parent series. Altogether, “*The Wealth of India — Raw Materials Series*” has around 10500 print pages covering more than 6000 plant species, 52 animal entries and 74 minerals. It is unique in terms of the format and coverage of articles, particularly botanical entries, viz. Nomenclature, Distribution, Cultivation, Pests & Diseases, Products & by-products, Traditional uses, Yield, Export/import data and Chemical constituents.

As an adjunct to *The Wealth of India Raw Materials Series*, a Raw Materials Herbarium & Museum (RHMD) was also established in 1977, essentially to showcase all major plant species, animals, and minerals dealt with within this encyclopaedia. These valuable rare collections serve as standard reference material enabling consultancy services on the identification/authentication of crude drugs and herbarium specimens received from students and herbal medicine manufacturing industries.

RS Jayasomu, Chief Scientist, CSIR-NIScPR
Adapted from <https://www.csir.res.in/csirblog-success-stories>



Council of Scientific & Industrial Research

Coating technology to mitigate corrosion of rebars in concrete structures

INFRASTRUCTURAL development, especially civil engineering works, plays a pivotal role in the economic growth of a nation, wherein critical and major structures like bridges, tunnels, dams, flyovers, and power plants are constructed with an average service life of 75 to 100 years.

Concrete is the lifeline of a country's civil infrastructure whereas steel (rebar) is the backbone of concrete. Our infrastructural projects face numerous challenges related to

long coastal belts and exposure to harsh marine environment conditions which affect the rebars. Pollutants such as chloride, CO_2 , sulphates, moisture, and oxygen present in the marine environment/seawater deteriorate the structures and severely reduce its service life by 10 to 15 years.

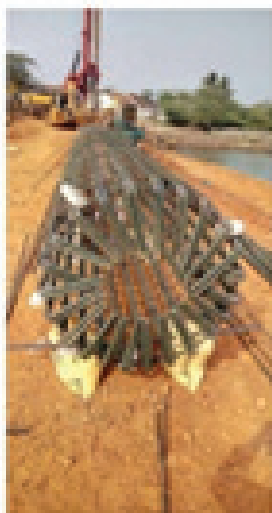
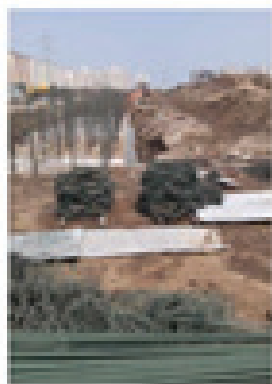
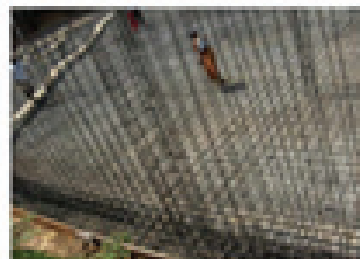
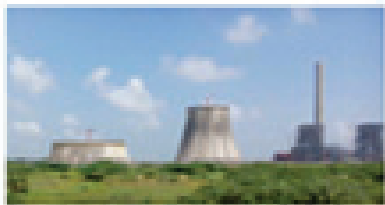
India loses around 5-7% GDP every year as a cost of corrosion towards replacement/rehabilitation of such structures. To protect them and to



a. CPCC rebars at site



b. CPCC rebars in DFCC Vaitarna to Surat



CPCC coated rods at various construction sites

enhance their shelf lives, suitable technologies should be deployed during the construction stage itself.

Common methods for corrosion protection of marine concrete structures are: (i) use of Corrosion Resistant Steel (CRS) rebar (ii) application of protective coating to steel (iii) application of protective coating to concrete surface and (iv) addition of inhibitor admixture to concrete. Among the above, the application of protective coating to rebar is the most promising and widely adopted method in India.

CSIR-Central Electrochemical Research Institute (CSIR-CECRI), Tamil Nadu, developed a novel coating system, Cement Polymer Composite Coating (CPCC), that is efficient, economical, easy to use and could be carried out at the site as well. This technology was developed during 1992-93 and Indian Patents were obtained in 2001 and 2004 for primer & sealer, respectively. Till now, CPCC has been transferred to 15 licensees out of which, 3 companies have renewed their licenses twice. Using this technology, more than 3 lakh tonnes of steel/rebars have been treated so far.

CPCC system fulfills all the requirements as specified in the ASTM A775/775M-19 for fusion bonded epoxy-coated rebar. The bars could be coated and used within a short span of time as the coating itself gets cured within a few hours. Repairing and touchup could be done as required with the same material that was used for coating. The coating is flexible (could be bent after coating) and at the same time, has good abrasion, impact, and weather resistance. The chloride tolerable limit is 7 times more than that of CRS (uncoated) rebar. Marine exposure studies conducted at CECRI's

Corrosion Testing Centre at Mandapam, Tamil Nadu (one of the world's most aggressive sites in terms of corrosion rate and paint deterioration) revealed that CPCC rebar exhibited 15 times more corrosion resistance than the CRS rebar.

Studies conducted on the relative bond strength of coated rebar (conducted as per the procedure given in BIS 2770 — Part I) concluded that the rebar was unaffected up to a thickness of $231 \pm 66 \mu\text{m}$ compared to that of uncoated rebar. Similarly, studies conducted in cracked concrete proved that up to the crack width of 0.2 mm, the CPCC rebars showed no signs of corrosion whereas at 2 mm crack width, negligible corrosion was observed.

Under similar conditions, uncoated rods showed severe rusting. Also, coated rebars could tolerate up to 2% of surface damage which may occur during construction practices. Concrete embedded with coated rods are expected to have a service life of up to 80 years whereas for uncoated rods it is less than 5 years in aggressive marine environment.

CPCC system is a boon for all major civil structures, especially those brought up in the vicinity of marine regions, offering enhanced protection and extended design life.

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