EUROPEAN JOURNAL OF ENVIRONMENTAL AND CIVIL ENGINEERING
2023, VOL. 27, NO. 4, 1813–1828
https://doi.org/10.1080/19648189.2022.2099982

Taylor & Francis
Taylor & Francis Group

Corrosion resistance behaviour of concrete containing treated used foundry sand

N. Gurumoorthy[a], K. Rajesh Kumar[b], M. Vinod Kumar[c] and K. Hariharan Kannan[d]

[a]Department of Civil Engineering, PSNA College of Engineering and Technology, Dindigul, Tamilnadu, India; [b]Department of Civil Engineering, SR University, Warangal, Telangana, India; [c]Department of Civil Engineering, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, Tamilnadu, India; [d]Department of Civil Engineering, Kamaraj College of Engineering and Technology, Virudhunagar, Tamilnadu, India

ABSTRACT

In the last two decades, the scientific community, by the efforts of researchers, has witnessed many attempts to find alternative materials for natural sand using industrial waste materials instead of natural river sand, with a major goal of preserving the natural environmental resources. One of the industrial waste materials, is Used Foundry Sand (UFS), which is processed and used in concrete as a partial replacement for fine aggregate as Treated Used Foundry Sand (TUFS). The precise and all-inclusive investigation on the corrosion resistant characteristics of TUFS blended concrete is very scant. Therefore, experimentations were conducted to study the corrosion resistance performance of TUFS as partial replacements for fine aggregate. TUFS were substituted for fine aggregate in different weight percentages. The reinforced concrete specimens were casted to 5% NaCl under accelerated corrosion process. Apart from half-cell potential measurement, impress current techniques were employed to assess rebar corrosion, and microstructural analysis was carried out using X Ray Diffraction (XRD). According to test results, TUFS concrete has better corrosion resistance qualities than control concrete, paving the way for high-quality concrete production.

ARTICLE HISTORY
Received 27 February 2022
Accepted 4 July 2022

KEYWORDS
Industrial waste material; high-quality concrete production; treated used foundry sand; impress current technique; X Ray diffraction

1. Introduction

The cost of construction materials has risen dramatically in recent years. Furthermore, there is a necessity for construction supplies to be always available as our natural resources (such as rocks for coarse aggregate and river sand for fine aggregate) are being depleted due to construction processes. In 2014, fine and coarse aggregate production consumed approximately 40 billion tones (Xiao et al., 2017). Fine aggregates make 20–35% of the volume of concrete mix. Fine aggregates used in manufacturing of concrete are generally natural river sand which is becoming more costly and considerably limited. On the other hand, hazardous waste materials are thrown into our natural environment without proper treatment, which affects the prosperous of nature. Hence there is an essential need to find an alternative way for protecting natural environment from the disposal of hazardous waste and from over exploitation of natural resources. To meet these needs, we can utilize waste products as alternate materials for fine aggregate. One of these materials is, high quality silica sand by product from the manufacturing of both ferrous and nonferrous metal casting industries, Used Foundry Sand (UFS) (Gurumoorthy & Arunachalam,

CONTACT K. Rajesh Kumar krk.prof@gmail.com Department of Civil Engineering, SR University, Warangal, Telangana 506371, India.