CT Innovations

TM-W011

Bi-Metallic Wire Mesh Performance:

TOUGHGalv

1.0 Abstract

Bimetallic zinc-aluminum (Zn-Al) alloys combine the favourable properties of both metals, resulting in materials with enhanced corrosion resistance, mechanical strength, and thermal stability. This paper explores the composition, properties, manufacturing processes, applications, and performance of Zn-Al alloy finish in various industrial sectors.

2.0 Introduction

Bimetallic Zn-Al alloys have been increasingly used in various industries due to their unique combination of properties. These alloys leverage the low melting point and good corrosion resistance of zinc with the high strength and thermal stability of aluminum. This paper aims to provide a comprehensive understanding of the characteristics, benefits, and applications of using bimetallic Zn-Al alloy finish for wire mesh cable tray systems.

3.0 Composition

TOUGHGalvanized Bimetallic composition 10% Aluminum (Al) with the remainder 90% Zinc (Zn).

4.0 Properties

4.1 Mechanical Properties

a) Strength: high strength and hardness 50-55 µHV

b) Ductility: the high ductility provided by aluminum provides compliance to ASTM B606 +660F.

c) Wear Resistance: superior wear resistance compared to pure zinc provides Taber Toughness +25%.

5.0 Performance & Reliability

5.1 Corrosion Resistance

Bimetallic Zn-Al alloy finish offers superior corrosion resistance compared to pure zinc or aluminum due to the formation of protective oxide layers. The synergistic effect of zinc and aluminum enhances the overall durability of the alloy in corrosive environments. When tested to ASTM B117 the Bimetallic Zn-Al finish will exhibit the same or superior corrosion resistance compared to stainless steel 304 and 316.

5.2 Mechanical Durability

The mechanical durability and reliability of bimetallic Zn-Al alloy finish remains stable over a wide range of temperatures and loading conditions. The ability to withstand mechanical stress and wear makes it reliable for demanding applications such as wire mesh cable trays which are subject to mechanical deformation during installation and dynamic loads in service.

5.3 Environment & Storage

Bimetallic Zn-Al alloy finish mitigates the risk of zinc whisker growth compared to a pure zinc finish. The Zn-Al alloy finish also mitigates the risk of wire mesh cable tray storage stain during transportation and storage prior to installation.

6.0 Applications

6.1 Automotive

Bimetallic Zn-Al alloys are used in the automotive industry for components such as bearings, bushings, and housings. Their high strength-to-weight ratio and excellent wear resistance contribute to improved fuel efficiency and durability.

6.2 Electrical & Electronic

In the electrical and electronics sector, bimetallic Zn-Al alloys are utilized for connectors, heat sinks, and enclosures. The alloys' good thermal and electrical conductivity, combined with corrosion resistance, make them ideal for these applications.

6.3 Construction & Data Infrastructure

Bimetallic Zn-Al alloys are used in construction for roofing materials, cladding, and structural components. The alloys corrosion resistance and aesthetic appeal contribute to long-lasting and maintenance-free structures.

6.4 Medical & Consumer Goods

Bimetallic Zn-Al alloys find applications in medical equipment springs, consumer goods such as hardware, sporting equipment, and household items. Their ability to be easily cast and finished makes them suitable for producing detailed, durable and reliable products.

7.0 Conclusion

Bimetallic Zn-Al alloy finished wire mesh cable trays offer a unique combination of properties that make them suitable for a wide range of applications. The enhanced corrosion resistance, mechanical strength, and thermal stability provide significant advantages over pure zinc or aluminum finishes. As manufacturing processes and alloy formulations continue to evolve, the use of bimetallic Zn-Al alloy finish is expected to expand, providing durable, reliable and safe solutions for various industrial sectors and applications, from Oil & Gas to Data Infrastructure.

8.0 References

1.1 CT Innovations, (2023). Material Data Sheet. TOUGHGalvanized.

1.2 Pola, A. & Goodwin, F.E. (2020). "Review of Microstructure and Properties of Zinc Alloys”. MDPI.

1.3 Polmear, I. J. (2006). "Light Alloys: From Traditional Alloys to Nanocrystals." Butterworth-Heinemann.

1.4 Davis, J. R. (2000). "Zinc and Zinc Alloy." ASM Specialty Handbook: Aluminum and Aluminum Alloys. ASM International.

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