Image Cover Sheet

CLASSIFICATION	SYSTEM NUMBER
UNCLASSIFIED	507224

TITLE

INORGANIC INTUMESCENT COATINGS FOR IMPROVED FIRE PROTECTION OF GRP

System Number:

Patron Number:

Requester:

Notes: Paper #21 contained in Parent Sysnum #507203

DSIS Use only:

Deliver to: DK

Inorganic Intumescent Coatings for Improved Fire Protection of GRP

K.B. Langille, D.T. Nguyen and J. O Bernt
J.O. Bernt & Associates Limited
Mississauga, Ontario

D.E. Veinot
Defence Research Establishment Atlantic
Halifax, N.S.

ABSTRACT

Glass reinforced polymer (GRP) has been identified as a potential structural for naval superstructures and offshore platforms. Although GRP has been used in commercial and pleasure crafts and other areas for the past 30 years, it has limited applications in the military due to its flammability.

Despite its poor fire resistance, GRP has advantages over metals that include high strength-to-weight ratio, stiffness-to-weight ratio, and excellent corrosion resistance. In marine applications, these advantages could result in lighter naval vessels, better performance and lower cost. The present challenge of GRP manufacturers is to resolve the problems of fire, smoke and smoke toxicity of vinylester or polyester based GRP. It must meet the requirements of military standards and building codes in order to expand the market share over metal alloys and other materials.

This paper examines the use of an inorganic coating to improve the fire resistance of vinylester resin based GRP. The selected coating is a totally inorganic system which does not release any organic gases or contribute to the fireload during the fire. The test data will include flame spread index (ASTM E162), smoke generation (ASTM E662), the cone calorimeter test (ASTM E1354), and the Navy Quarter Scale Room Fire Test.

Outline

- Background
- Organic vs Inorganic Systems
- Compositional Development
- Small and Large Scale Evaluations
- Video of US Navy 1/4 Scale Test
- Tech Transfer/Commercial Opportunities
- Summary

Background

- Fire at Sea / Falklands Conflict
- Aim to Minimize Spread of Fire
- Protection of Vulnerable Substrates
- Use Non-toxic Non-combustible Coatings
- Low Cost and Retrofit Capability
- Commercialization

Organic Intumescent Coatings

- Can Add to Fire Load
- Uncontrolled Release of Blowing Agent
- Produce Smoke and Toxic Gases
- Ablation of Surface Char
- Expensive

Inorganic Intumescent Coatings

- Non-combustible / No Added Fire Load
- No Toxic Gases or Smoke
- Strong Rigid Intumesced Structure
- Inexpensive

Silicate Compositions

- Sodium Silicate
- Potasium Silicate
- Litium Silicate
- Sodium/Potassium/Lithium Phosphosilicate
- Mixtures of the Above Silicates

Formulations

- Dried From Solution
- Powdered Granules in Silicate Solution Binders
- Powdered Granules in Latex Binders

Small Lab Scale Evaluation

- Degree of Intumescence
- Water Solubility
- Hygroscopicity
- Efflorescence
- Flexibility
- TGA and DSC for Weight Loss vs Temp

Large Scale Evaluations

- Modified ASTM E 119
- Standard Room Fire Test at NRCC Ottawa
- US Navy 1/4 Scale Fire Test
- Underwriters Lab Test of Fire Door

Technology Transfer

- To J. O. Bernt and Associates Limited
- DREA Research Contracts
- Canadian and US Patents
- DIR Assisted Research and Pilot Plant Setup
- DIPP Assisted Manufacturing

Commercialization

- Fire Doors
- Fireproof Penetration Sealants
- Fire Protective Coatings
- Filled Aluminum Siding (Reynolds)

Summary

- Non-combustible, Non-toxic, Inorganic Intumescent Coating Developed
- Passed Large Scale Testing and US Navy 1/4 Scale Test for Ships and Subs
- Technology Transferred to Canadian Industry
- Fire Doors, Sealants, Coatings and Filler for Aluminum siding