BARRIER PLUS

One component waterborne barrier coatings

Proposal Full Title: One component waterborne barrier coatings

Proposal Acronym: BARRIER- PLUS

Type of funding scheme: Research for Associations, FP7-SME-2012-2

Name of co-coordinating person: PRA

List of participants:

Participant Number/ Type of Participant	Participant Organisation Name	Participant Organisation Short Name	Country
1/(Co-ordinator)/RTD	PAINT RESEARCH ASSOCIATION	PRA	UK
2/SMEA	NORSK STÅLFORBUND	NSA	Norway
3/SMEA	EUROPEAN FEDERATION OF CORROSION	EFC	EU (Belgium)
4/ Other/end-user	VIOMICHANIA RITION MEGARON ANASTASIOS FANIS ANONYMOS ETAIRIA	MEG	Greece
5/ Other/end-user	INTERSERV - SOCIEDADE TECNICA DE SERVICIOS LDA	ISTS	Portugal
6/ SMEA	TUINSA NORTE SA	TUINSA	Spain
7/ LE	SHERWIN-WILLIAMS PROTECTIVE & MARINE COATINGS LIMITED	SHW	UK
8/RTD	UNIVERSITÉ CLAUDE BERNARD LYON 1	UCBL	France
9/ RTD	UNIVERSITY OF SURREY	SURREY	UK
10/ SMEA	EUROPEAN CONVENTION FOR CONSTRUCTIONAL STEELWORK	ECCS	EU (Belgium)

State-of-Play

The BARRIER PLUS project is a 3-year R4SME Association project, worth €3 million, with a current consortium comprising 3 SME Associations, 3 SME companies, one large enterprise and 3 RTD organisations. The project has been successful in gaining funding from the EU and started on 1st January 2014. However, for various reasons, two partners need to reduce the amount of time they contribute to the project and therefore the consortium wishes to recruit one but probably two new partners with a particular interest in anti-corrosion coatings, their application to constructional steelwork and/or health and safety aspects of coatings.

Scientific objectives

The project goal is to develop a waterborne one component acrylic coating, with enhanced barrier properties. The coating will not contain hazardous materials and can be used to replace multi-component protective coatings in direct-to-metal applications and in multi-coat maintenance applications, and as a sealer for zinc-rich systems. Our approach involves the combination of three polymer latex technologies recently published in the scientific literature: (1) surfactant-free self-crosslinking (silane technology) latices, (2) polymer-encapsulated inorganic particles and (3) polymer latex particles stabilised by inorganic particles. In order to achieve the necessary performance requirements for this coating technology, we need to develop a range of examples of each latex technology. We need to study the particles during the deformation and coalescence phases of the film formation process, the effect of particle size of each latex type on the ultimate paint barrier properties and the speed of drying and curing (the mechanism by which water is moved through the coating and evaporates).

The scientific objectives are:

- To investigate the role of inorganic materials incorporated as part of polymer latex particles, including the effect of particle size and morphology of the inorganic component, on the barrier properties;
- To develop a model of the barrier properties of these one component waterborne coatings, which takes into account the form of inorganic materials (whether acting as polymer stabiliser or particle core), particle size and morphology of latex particles as it determines the continuity of each phase, the nature and amount of crosslinking chemistry and the nature of the polymer latex composition (in terms of the proportion and distribution of 'hard' and 'soft' monomer units);
- To increase understanding of the drying process of waterborne coatings comprising inorganic species (intentionally included to improve barrier properties).

Our interest in the hybrid latices is largely confined to clays, silica, mica, micaceous iron oxide and cerium oxide, with particular interest in incorporating lamellar inorganic particles, in order to increase the barrier to water and oxygen. The University of Lyon is particularly interested in using cerium oxide as a latex particle stabiliser: we are interested because it is an oxygen scavenger. However, we are also interested in the use of lamellar-shaped clay materials at this time, particularly for stabilising latex particles.

Market information

The market focus for this work is protective coatings for steelwork, which is a huge global market. The global protective coatings market is estimated to be between 1.3 to 1.5 billion litres (1.6-1.8 million tonnes equating to ~€8 billion) with an annual growth rate of about 4%. In Europe, in 2006, the total demand for protective coatings market was estimated at 383 thousand tonnes (319 million litres) valued at €1.7 billion, of which about 50% was used for new construction. We believe the BARRIER PLUS technologies would be applicable to both new and maintenance sectors of the protective coatings market. It will compete with other technologies (eg solventborne 2K systems) for applications in the lower categories of corrosivity, although future environmental legislation may influence the degree of waterborne penetration into what is a predominantly solventborne market at present.

Role of SME Associations

The role principally involves (i) steering/guiding the RTD work packages and importantly (ii) disseminating the results of the project at conferences, trade fairs, exhibitions, through articles/newsletters or to their member companies if an Association. There is no financial contribution by the partners to the project, their contribution is in the form of an 'in-kind' contribution, ie time spent involved in work relevant to the project, eg attending meetings, reading reports or minutes, preparing any dissemination documents, or just talking to people about the project (dissemination) or within the consortium sharing knowledge or experiences.

The required time commitment is 6-8 person months (ie up to 128 days) over the three year project and the organisation will receive a financial contribution of the order of €13-18K to cover travel/accommodation expenses.

Benefits to the Partners

The BARRIER PLUS project contains a number of innovative approaches to the development of a waterborne 1K barrier coating for metal surfaces and will generate significant intellectual knowhow and patentable innovations: in particular, at this time we expect IPR developments in the fields of surfactant-free self-crosslinking latex particles, polymer encapsulated inorganic particles and Pickering stabilised latices, and important knowhow in the fields of barrier property models of 1K waterborne coatings, formulation and testing of these products.

These innovations and outcomes will provide the following benefits to the SME Associations:

- The SME Associations will generate revenue (license fees and/or royalty payments per litre) from initial manufacturing licences (offered initially to Sherwin Williams as a partner in the project) and access to patents filed during the project;
- Offering a safer product to our SME membership;
- Re-investment of any revenue generated post project to enable future R&D projects, training and dissemination activities for the benefit of our SME members; and
- Increased membership due to the ability to raise their profile and deliver benefits to the SME members, securing existing membership and creating new members across the SME Associations.

In addition, the project provides the opportunity to network with other organisations with similar interests.