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BUILDING MATERIALS BASED ON ADVANCED POLYMER MATRIX
Review

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Developments in civil engineering and industrial growth have created a continual demand for building materials with new and improved performance attributes. Polymer concretes (PC) appear to offer possibilities for meeting these new requirements. By polymer concrete is meant a polymer composite with a polymer matrix and sand and rocks, like those used in Portland cement concrete, as inclusions. Service conditions often dictate specific material requirements that may be met by PC when several composite properties are considered simultaneously.

Advancements in PC materials have slowed over the past 25 years compared to the rate of advancements in the 1970s and 1980s. The knowledge base in concrete polymer materials has matured as many products have been made commercially available. There are now many polymer-based construction materials that have been shown to perform very well for their intended .purposes: concrete spall repair, crack repair, concrete overlays, and precast concrete components. The cost of polymer-based systems is high relative to conventional portland cement concrete materials, and it is necessary to demonstrate the improved durability, reduced thickness/size, ability to be placed in difficult environmental conditions, and/or the fact that other non-polymer materials will not work. There are many situations for which concrete-polymer materials prove to be the most appropriate materials for the intended application.

Understanding of the nature of PC is necessary for the design of the most cost-effective PC composites and to produce materials with desired properties.

Polymer concrete is usually used in severe conditions in industrial and public buildings as well as in transportation and hydraulic structures. The main uses are repair, strengthening, and corrosion protection of concrete structures . The main advantages of polymer concrete over ordinary concrete are improved mechanical strength, low permeability, and improved chemical resistance. The main limitation is their relatively high material cost. This is why it is important to find the optimum technical/economic compromise. To solve this problem, it is necessary to formulate a reliable predictive mathematical model of polymer concrete material properties.

One of the new kinds of the structural polymer building materials created recently is rubber concrete based on polybutadiene binder (is short for *RubCon*). *RubCo*n is developed and investigated in Voronezh State University of Architecturel and Civil Engineering (VSUACE) research team at the head of ***Prof Yu Potapov*** and ***Prof. Yu.Borisov*** at participation of ***Prof. O.Figovsky, Dr. D. Beilin*** (Polymate INRC). *RubCon* is noted for its effective operational characteristics : the highest chemical resistance and some physical-mechanical properties, adaptability to manufacture, small shrinkage etc.

Application of RubCon in practice of construction allows to solve a problem of corrosion, negative influence of temperature, degradation of a material at raised UV - exposure, radiation and other adverse natural and technogenic factors, to increase the between-repairs period, reliability and durability of buildings and structures especially at action of aggressive environments. It is necessary to note, that *RubCon* is more cheaper in comparison with other corrosion resistant polymer composites.

The extensive studies of *RubCon* have conducted in VSUACE . The complex of physical-mechanical, heat-physical and technological properties of *RubCon* , its behavior in conditions of influence of a broad aggressive environment spectrum , problems of durability and reliability are

studied, pilot test of *RubCon* as the new structural building material at the enterprises of various industries is made.

The novel non-isocyanate polyurethane binders for monolithic flooring and industrial coating compositions were elaborated by researcher team from Polymate Ltd.- International Nanotechnological Research Center at head of ***Prof O. Figovsky*** and ***Dr. L. Shapovalov***. The two-component binders have unique operational characteristics that combine the best mechanical properties of polyurethane and chemical resistance of epoxy binders. These materials do not present health hazards since they do not consist of isocyanate components at any stage of preparation. The environmentally friendly binders and coatings are insensitive to the moisture in the air or the coated surface and provide for making monolithic nonporous materials with decreased permeability.