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Industrial Chemistry 2020-Title: Addressing Stain Resistance of Coatings by New Experimental and Modeling Techniques – Zeena Cherain- Ashland Specialty Ingredients

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Abstract

Today's discerning interior architectural coating consumers value paints that offer low odor, improved application and end use performance attributes such as flow and leveling, scrub and stain resistance etc. Stain resistance is the ability of the coating surface to withstand discoloration caused by contact with various type of stains. There is a concerted effort in the coating industry to develop interior water-based paints with improved stain resistance to hydrophilic and hydrophobic stains. Achieving stain-resistant properties for the paints require a combination of tailored polymer dispersions, balanced paint formulation ingredients and efficient use of rheology modifiers. This study describes new techniques such as molecular modeling (which looks at interactions between key components in paint such as binders, rheology modifiers etc), Atomic Force Microscopy (AFM-which looks at the paint surface to decipher the distribution of various components such as thickener and stain molecules) and Quartz-Crystal Microbalance (QCM- which looks real time at the adsorption and desorption process of stains on paint surfaces) have been developed to get a better understanding regarding the major contributing factors that cause staining. The objective of the study is to understand the overall mechanism of stain formation and removal that should help in designing, formulating and fine-tuning improved stain-resistant coatings.

Stain obstruction alludes to a materials' capacity to withstand discolouration brought about by contact with fluids, including oil and oil, as well as strong surfaces. Normally a fluid stain happens because of a fiber being Hydrophilic?, where the fluid gets consumed by the fiber, and on drying the fiber turns out to be unexpectedly stained for example recolored. With any texture structure pores are made during the interweaving of the yarns; yarns additionally have between fiber spaces. Likewise, fine particles from contact with strong materials can cling to the fiber and texture surfaces, or become installed into the yarn or potentially texture interstices, which additionally bring about stains. Stain obstruction is straightforwardly identified with oleophobic and hydrophobic functionalities.

The fundamental target of stain obstruction is accordingly to forestall fluid retention and fine particles adherence to both fiber and texture surfaces. This target can be by using the natural properties of specific strands or by applying stain opposes (for example certain added substances, coatings or completions) to texture surfaces.

Contingent upon the kind of stain obstruction treatment utilized, contact and infiltration of the texture or fiber can be totally repressed, guaranteeing the avoidance of contact recoloring.

Application is a significant piece of the viability and strength of the stain obstruction of the fiber. The centralization of the hindrance gave by the substance is influenced by the strategy for application. Application strategies utilized today include:

• Post color application utilizing a Kuster Flexnip on a ceaseless color range

• Single cycle in a beck or twofold cycle in a beck

• Yarn application for space color yarn

The development of Nano-tex® texture was motivated by the perception of the water-repellant and self-cleaning properties of the leaves of the lotus plant. Two components are vital to this normal marvel: actual structure and science. To begin with, the surface cells structure thick microstructures that resemble round spikes. These little structures decline the contact region between the leaf and a water bead and make a pad of air that limits ingestion. Second, the lotus leaf microstructures are shrouded in nano-scale wax precious stones, which are hydrophobic and subsequently repulse water.

Also, Nano-tex® texture is made of 100% cotton filaments covered with harsh, hydrophobic atoms usually called "nano-stubbles". These small filaments (10-100 nm) are 1/1000th of the size of a typical cotton fiber and are for all time clung to the outside of the texture, mirroring the surface structure of a lotus leaf or peach fluff.

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The nano-hairs are made of carbon-based hydrophobic polymers called perfluoroalkanes. These polymers contain fluorine and are like the particles found in Teflon®. Albeit mechanical fluorochemistry has been related with non-great ecological and wellbeing impacts, researchers have so far been not able to create a similar degree of repellence with less hydrophobic nano-filaments alone.

Biography: Zeena Cherian is a senior staff scientist in Ashland's Specialty Ingredients Coatings Innovation group in Wilmington, Delaware since 2016. She received a Master's degree in Materials Engineering from the New Jersey Institute of Technology (NJIT)-New Jersey, and a Master's degree in Polymer Technology from the Cochin University of Science and Technology, India. She is the receipient of American Coatings Award 2020.

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