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Superior Silica's *SUPSIL™ REPEL* Shows Significant Improvement in Surface Guardian's Water Repellant Coatings

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Introduction

Surface Guardian is a St. Louis based company that works on surface protection products and surfaces. The company's coating differs from other coating companies, due to their unique nano-polishing compound developed by founder, Keith Aggas, in 1982. With the use of their coating products, fingerprints cannot be left on the material's surface, regardless of the material. This has been proven and tested since 1982. Some of the surfaces that can be treated with Surface Guardian's permanent sealants are dishwashers, microwaves, granite counter tops, marble floorings, hardwood floors, automobiles, boats, windows, and many more.

With today's continuous advancement in technology, Surface Guardian is looking to improve their own technology. Some of the properties they are looking to improve are the depth, hardness, brightness, glossiness, scratch resistance, hydrophobicity, and heat/thermal resistance of their coating. In recent efforts to improve these properties, a series of tests were performed to determine if including Superior Silica's superhydrophobic 100nm *SUPSIL™ REPEL* silica nanoparticles would improve these characteristics. Superior Silica offers high quality, monodisperse silica nanoparticles that can be used in a variety of applications, including coatings.

Materials and Methods

For this recent study, two batches of coatings were made and tested separately. One batch was just tested for depth analysis on one surface, while the other batch was applied to multiple surfaces and tested for analysis of all characteristics of interest. These characteristics include depth, hardness, brightness, glossiness, scratch resistance, hydrophobicity, and heat/thermal resistance.

The first batch consisted of the materials listed in Table 1.

Table 1. Materials used in Batch 1 of Surface Guardian coating test.

Material	Amount (oz.)
Surface Guardian Acrylic Resin	0.25
100nm <i>SUPSIL™ REPEL</i> Silica Nanoparticles	0.15
Surface Guardian Nano-polishing Compound	0.10

The materials presented in Table 1 were mixed together in a paint mixing machine until the mixture became a thin liquid. A thin coating of the mixture was applied to a metal surface at 60°C. The surface was allowed to haze for 30 seconds before the coating was buffed off. The surface depth was measured before and after the coating was applied.



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The second batch contained the materials listed in Table 2.

Table 2. Materials used in Batch 2 of Surface Guardian coating test.

Material	Amount (oz.)
Surface Guardian Acrylic Resin	0.50
100nm <i>SUPSIL™ REPEL</i> Silica Nanoparticles	0.30
Minusil 30 Silica	0.50
Minusil 10 Silica	0.50
Surface Guardian Nano-polishing Compound	0.20

The materials listed in Table 2 were crushed and mixed for one minute, until the mixture became a base thin liquid. Test objects were set up for the coating to be applied to. These objects include a 2'x2' piece of granite, a 2'x2' piece of Italian marble, a 12"x4" piece of lead glass, a 4'x4' piece of stainless steel, a 4'x6' piece of fiberglass, and 4'x3" oak and maple hardwood floor slats. A thin coating was applied to each test piece and was allowed to haze for one minute before buffing and polishing the surface. Once the pieces were clean and wiped down with a tact cloth, a series of harmful chemical mixtures were applied to each surface. These mixtures include muriatic acid, lemon juice, tomato juice, orange juice, grape juice, and red wine. All of these products are acidic in nature and would etch or mar the substrate of each object without a coating. Other tests were also performed to observe the coating performance with respect to depth, hardness, brightness, glossiness, scratch resistance, hydrophobicity, and heat/thermal resistance.

Analysis and Results

The first batch was only tested for depth. Before applying the coating to the metal, the depth was 3.5 mil. After applying the coating, the depth had increased to 3.6 mil.

For the second batch, a difference from normal weight and texture of the liquid mixture was noticeable, as well as an increase in brightness and gloss. However, the color of the mixture remained unchanged. A depth gauge was used on each surface, which showed that the hardness of the material had increased by 2-fold with the coating applied. The depth had also increased by 1mil for each surface. Using a reflective gloss meter, it was observed that the depth, brightness, and gloss had increased by 23%, which is unheard of in any industry. Additional findings include that the materials show scratch resistance to hardness of 9 or above, superior super hydrophobicity, heat and thermal resistance up to 900°C, and anti-graffiti characteristics.

From these results, it can be said that the combination of Surface Guardian Nano-Polishing Compound and Superior Silica's 100nm *SUPSIL™ REPEL* Silica Nanoparticles shows improvement in the characteristics of Surface Guardian's coating. In fact, these results show the highest increases out of all of Surface Guardian's testing since 1982, which is positive outlook for Surface Guardian's coating technology.