

Potential Alternatives to PFASs in Carpets and Rugs

Safer Consumer Products (SCP) has compiled a list of alternatives to PFASs in carpets and rugs to assist manufacturers looking for substitutes. Some of these stain-resistance alternatives may be applicable to treatments for converted textiles and leather, SCP's next Priority Product. SCP identified these through its own research and outreach to academics, government agencies, non-governmental organizations, and product manufacturers.

The list of alternatives has **not been vetted as safer alternatives** and listing on this site is **not an endorsement** of these products by SCP. This is a **non-exhaustive list** of alternatives that need to be evaluated in the Alternatives Analysis, per title 22 of the California Code of Regulations, section 69505.5. The information in this list is based on information in the public domain as of September 2021. The companies on this list may change the use of an alternative on this list and are not required to inform SCP of such a change. In addition, some companies may use multiple alternatives and/or may have multiple product lines that use different alternatives, which may include the chemical of concern, PFASs. The description of the product in the list below contains information directly from the manufacturer that SCP has not independently confirmed. The source of the description is also provided.

The alternatives have been grouped into two categories: non-chemical and chemical alternatives. Non-chemical alternatives offer a different approach to stain resistance for carpets and rugs or the production of the fibers used in them. However, some of these non-chemical alternatives potentially use an additional chemical treatment to confer stain and soil resistance. Chemical alternatives are used on the carpets or the fibers themselves to provide stain and soil resistance. **SCP has not assessed the safety of these alternatives.** To evaluate their safety, these categories of alternatives would need to be assessed in an Alternatives Analysis.

Non-chemical Alternatives

Alterantive type	Chemistry	Name(s)	Description
Fiber choice	Sulfonated nylon	Universal Fibers, Interface Carpets Inc., Aquafil, Stainmaster	Sulfonated co-polymers are woven together with typical nylon fiber. The Sulfonation helps prevent stains by blocking the sites (terminal amines) that tend to attract acidic stains. Removing PFAS has improved stain and soil resistance because stains could be trapped under the PFAS coating and could no longer be cleaned (Davis 2019). Explanation provided by Universal Fibers.
	Nylon 6.6	Antron® fibers, StainMaster, Universal Fibers & Interface Carpets	This type of nylon provides partial soil resistance but may still require a topical stain and soil-release coating. It may also provide better wear-resistance but is less recyclable (Antron 2014; Flooristics 2018; Simmons 2019).
	Polytrimethylene terephthalate (PTT)	Sorona®, Triexta™, CORTERRA	<p>PTT fibers have superior stain resistance compared to nylon and are similarly durable, resilient, and soft (Bhattad et al. 2013).</p> <p>It is a thermoplastic polyester fiber that can be spun into yarns that are used extensively in the carpet industry. The fiber is composed of 1,3-propanediol (PTT) and terephthalic acid of dimethyl terephthalate (Polymer Database 2015).</p> <p>PTT provides lower water absorption and has the potential to be recycled (Swicofil n.d.).</p>
	Polyethylene terephthalate (PET) or polyester	-	PET fibers, also known as polyester, are inherently stain resistant (Teli 2018)
	Wool	-	Wool fibers are inherently hydrophobic and can resist water-based stains, but not oil-based stains or soil (Johnson and Russell 2009).
	Polypropylene	-	Polypropylene fibers, are inherently stain-resistant and may not need chemical treatment (Davis 2016).

Alterative type	Chemistry	Name(s)	Description
Product redesign	Polyester (or PET); polyurethane coating	Ruggable®	From Manufacturer: These are 2-part area rug systems where the top, decorative part is machine washable. The top is made from polyester (also known as polyethylene terephthalate) with a protective polyurethane coating (Ruggable n.d.)
	Acrylic, polyester, or wool	Washable by Rugs USA	Other washable area rugs are on the market that are made from acrylic, polyester, or wool. It's unclear whether the fibers make these area rug "spill and stain resistant" or whether they have been chemically treated as well (Rugs USA 2021).
Process redesign	Providing safer carpet cleaners with the sale of the carpet	-	An option for keeping carpets clean is to use safer carpet cleaners. Safer, non-PFASs cleaners and protectants may be provided with the sale of carpets so that they can be cleaned effectively.

Chemical Alternatives

Chemical category	Product name	Brand or manufacturer	Description
Non-Fluorinated Acrylates	Tandus Centiva Eco-Ensure	-	<p>Tandus Centiva Eco-Ensure is an advanced defense soil treatment for carpets. It is a non-fluorinated treatment and while its exact chemical composition could not be determined, the manufacturer reports that it consists of “carbon, hydrogen, oxygen, sodium, sulfur, and nitrogen.”</p> <p>Eco-Ensure qualifies for Platinum Level Cradle to Cradle Certification, which means it is free of halogenated compounds. According to this certification, Eco-Ensure does not carry any risk of exposure to carcinogens, mutagens, or reproductive toxicants (Cradle to Cradle 2020).</p>
	NanoLoc	Mohawk	From manufacturer: NanoLoc™ is an advanced nanotechnology introduced in 2005 that ultra-fine nanoparticles bond together on a molecular level to completely encapsulate the carpet fiber to create a superior spill and soil barrier. According to an industry consultant it is acrylic based. NanoLoc™ claims to provide permanent, lifetime stain protection.
	N/A	Invista (unclear whether this is on the market/used on their carpets)	From the manufacturer: The 2017 Invista fluorine-free composition for water repellence and soil resistance includes a nanoparticulate silicate clay (e.g., Laponite® SL25), an anionic acrylic-based copolymer binding agent (e.g., Primal™ ECO-36), water and other auxiliary stabilizers. The alternative can be applied either to natural or synthetic fiber and display[s] improved water and soil repellency characteristics. (Invista North America 2017)
Silicones, Silanes, & Siloxanes	unknown	-	<p>Silicones and silanes are found in many commercial products and have rigid rough surface patterning that effectively repels liquids. “The most common silicone is polydimethylsiloxane (PDMS)...PDMS has been used to produce a nylon fabric coating which is both hydrophobic and oleophobic...A siloxane polymer functionalized with alkyl groups of varying chain lengths has also been used to create a coating that is both hydrophobic and semi-oleophobic” (Bischoff et al. 2020).</p> <p>Some uncertainty exists as to the potential release of persistent siloxanes during the lifecycle of silicone-based repellents” (Danish Environmental Protection Agency 2015).</p>

Chemical category	Product name	Brand or manufacturer	Description
Proprietary wax	-	Universal Fibers	<p>From Manufacturer: Universal’s yarns are treated with advanced low-soil finish technology, specifically formulated to charge the filament surface to repel/minimize initial soiling and promote wet extraction cleaning of deposited soils.</p> <p>“Fluorochemicals present a long-term carpet-cleaning problem when the protective layer is partially compromised, it allows soil to penetrate underneath. For these reasons, Universal’s yarns provide excellent soil protection using better alternative chemistries.” (Universal Fibers n.d.)</p>
Modified hydrophobic polyester	R2X	Shaw	<p>From the manufacturer: R2X stain and soil resistance technology protects your carpet with protection that is molecularly bonded to the carpet fiber, R2X won’t wear off – even after repeated cleanings. Spills and messes easily stay on top of the carpet fiber and won’t seep deep. This gives you time to simply wipe away the mess. Shaw Floors is committed to providing access to safe, sustainable products – perfluorinated compounds, also known as PFC or PFAS are not used in today’s R2X stain treatment (https://shawfloors.com/why-shaw/about-us/shaw-advantages/carpet-advantages/r2x-stain-resistance).</p> <p>Some products treated with R2X are Cradle to Cradle Certified, with a silver rating for material health. The certification ensures that there is no exposure to carcinogens, mutagens, or reproductive toxicants (Cradle to Cradle Products Innovation Institute 2019).</p>
Dendrimers	ECO-DENTEX	Hilaturas Miel, SA (HIMIESA)	<p>From the manufacturer: HIMIESA developed a process for making acrylic threads and mixtures thereof with waterproof and stain resistant properties using materials with low environmental impact, which allow the substitution of the fluorocarbon that were conventionally used (https://eeagrants.org/archive/2009-2014/projects/ES02-0120).</p> <p>HIMIESA states that their threads are used to produce home items such as bed linen, curtains, rugs, and carpets.</p>

Chemical category	Product name	Brand or manufacturer	Description
Paraffin	unknown	-	<p>The repellent alternative is usually an emulsion of paraffins made up of metal salts (commonly aluminum, zinc, and zirconium) and fatty acids like stearic acid. These have been on the market for many years and provide similar functionality as other non-fluorinated stain and soil repellents (Danish Environmental Protection Agency 2015).</p> <p>In a report by Holmquist et al. hydrocarbon waxes were evaluated using the hazard assessment criteria from the Design for the Environment program (DfE). The criteria include acute mammalian toxicity, carcinogenicity, mutagenicity/genotoxicity, reproductive and developmental toxicities, neurotoxicity, repeated dose toxicity, sensitization, irritation/corrosivity, endocrine activity, acute and chronic aquatic toxicity, persistence, and bioaccumulation. Based on the DfE criteria, the hydrocarbon waxes had a relatively low hazard profile and were classified as low concern for all endpoints, except repeated dose which was moderately hazardous, with high uncertainty. Endocrine effects and neurotoxicity were reported as data gaps (Holmquist et al. 2016). Although the hydrocarbon waxes have a relatively low hazard profile, it's noteworthy that hydrocarbon wax-based repellents have flammability concerns (Danish Environmental Protection Agency 2015).</p>
Polyurethane (poly-coating)	Ruggable	-	<p>PU coating on fabrics like polyester, nylon, cotton and leather act as a base material on one side of the material. It's a protective film that's usually applied to one side of the material (https://www.beanbagsrus.com.au/blog/what-is-pu-coating-on-fabric/).</p> <p>Volatile isocyanates are potent sensitizers and used in the manufacture of polyurethane.</p>
Unknown	Karpetcryl	Fiber Shield Industries	<p>From the manufacturer: Karpetcryl is a fluorine-free water, soil, and stain repellent for sisal and viscose carpets (https://www.fiber-shield.com/).</p>
Unknown	DuraTech®	Invista	<p>From the manufacturer: In 2016 Invista announced the introduction of “a new and advanced DuraTech®, now made with a fluorine-free topical soil resistance treatment that also meets the rigorous certification testing process for the Antron® brand, ensuring the carpet will perform and last.” (https://www.floortrendsmag.com/articles/100483-invistas-antron-brand-introduces-advanced-duratech.)</p>

Possible Chemical Alternatives

These chemical treatments confer durable, water-repellency to textiles but it's unclear whether these are appropriate alternatives for carpets and rugs. These may be more applicable to protective coatings for outdoor clothing and gear.

Product name	Company name	Notes
Eco Pur	Dimpora	Membranes seem marketed for outdoor gear. The waterproof fluorine-free membrane is mainly based on polyurethane (https://dimpora.com/ecopur).
EMPEL	Green Theme Technologies (GTT)	EMPEL is a hydrocarbon-based polymer treatment that outperforms PFAS formulation on water repellency, but not oil-stain resistance. GTT has developed a safe and sustainable cleaning technology for removal of stains from their EMPEL-treated fabrics. This cleaning method, which can be a consumer-used product uses non-VOC (and non-fluorocarbon) chemicals to remove oil stains and to replenish the water repellency and stain repellency of our pressure-based treatment. GTT thinks that EMPEL finish can be applied to carpets and rugs; however, they have not yet started on that product application (https://www.empel.green/).
Sciessent Curb®	-	Sciessent Curb® is a fluorine free durable water repellent for textiles that is made without perfluorinated chemicals or fluorinated silicones (Marketplace.ChemSec.org).
EVO Protect DWA	Dystar	Dystar offers a full range of ecological fluorine-free products for all demands. EVO Protect DWA is suitable for application on cotton, cellulosic fibres, and for PA and PES fibres (Marketplace.ChemSec.org).
Sympatex Laminate	-	The Sympatex membrane is highly breathable, 100% waterproof. It is 100% recyclable, climate-neutral, bluesign® certified, and it received the 'Oeko-Tex-Standard 100' certificate. It is also PTFE-free and PFC-free (Marketplace.ChemSec.org).
miDori® evoPel	-	evoPel provides an alternative to so called PFC based stain repellent products. It is partially based on plant seed oils and is a USDA certified bio-based product (Marketplace.ChemSec.org).
UNIPERL	-	UNIPERL® is a range of fluorine-free finishing auxiliary agents that imparts water-repellence, rainproof and aqueous stain-management. These generally seem to be acrylic polymers mixed with paraffins or silicones (Marketplace.ChemSec.org).

Product name	Company name	Notes
Nanooki	-	Aqueous or alcohol-based solution of silicon dioxide (SiO ₂), for textiles and leather.
NEOSEED	Nicca Chemical Co.	Potential applications including carpet, and ingredients including a nonionic polymer, ester compound, hydrocarbon compound, organic solvent, and water (Danish Environmental Protection Agency 2015).
Ecorepel	Schoeller Textil AG	Paraffin-based repellent for clothing and non-clothing, effective on many types of fibers and many blends (cotton, polyester, wool) (Marketplace.ChemSec.org).
Arkophob FFR liq	Archroma Management GmbH	Paraffin-based repellent for clothing and non-clothing textiles, suitable for most textiles. Mostly for outdoor wear (Danish Environmental Protection Agency 2015).
Phobotex APK, Phobotex JVA, Phobotex RCO, Phobotex ZAN	Huntsman	Paraffin-based repellent for clothing and non-clothing textiles, suitable for most textiles and gear (Danish Environmental Protection Agency 2015).
Texfin® HTF	Texchem	Paraffin based protectant for polyester/cotton blends, nylon and polyester, cellulose. Suitable for all major fibers (Danish Environmental Protection Agency 2015).
MLSE	-	MLSE® is a unique technology that has the ability to treat both natural and synthetic textiles for a wide variety of functionalities; These include dyeability and printing enhancements, hydrophilicity, hydrophobicity, fire retardancy and anti-microbial properties. The use of water, harmful chemicals and energy is significantly reduced in comparison to conventional textile treatment methods (https://marketplace.chemsec.org/Alternative/MLSE-Multiplexed-Laser-Surface-Enhancement-for-Textile-381).
zeroF	CHT/Bezema	The impregnation is produced on a fluorine-free polymer base (Danish Environmental Protection Agency 2015).
Itoguard NFC	LJ Specialties	Paraffin based protectant for use on cellulosic and synthetic fabrics and their blends. (Danish Environmental Protection Agency 2015).

Product name	Company name	Notes
RUCO-DRY ECO® PLUS from Bionic-Finish (ECO)	Rudolph Group	<p>RUCO-DRY ECO® was developed based on a technology which is environmentally friendly and fluorine-free using highly branched polymers, and already belongs to the 3rd generation of products based on fluorine-free formulas. It conveys higher efficiency combined with better permanence and sustainability. Oil and chemical repellency naturally cannot be achieved by this chemistry (https://www.rudolf.de/en/technology/bionic-finish-eco/).</p> <p>According to H&M, RUCO-DRY ECO® consists of polymers mainly made from hydrocarbons and minor amounts of polysiloxanes. The polysiloxane is linear and the persistent, cyclic siloxanes D3, D4, and D5 are not present (H&M Group 2017).</p>

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