

Products for radiation curing

Protecting product performance



The elements of success

You need a partner who can see the big picture when it comes to your products, your processes and your customers. Our experience and expertise in the special niches of organic chemistry, process technology and application development are at your service, providing you with a complete chain of solutions to enhance quality and profitability at every step.

Our versatile intermediates, an essential element of your winning formula, are specifically designed to add value and enhance end-product performance. Your solution to meeting the increasing demands for safer, lighter, more durable and environmentally friendly end-user products, begins here.

Innovation in everything we do

Innovation distinguishes every aspect of our business process. Developing smarter and safer solutions creates real value in new chemical applications. Focused innovation instills leadership and purpose in our business activities, improves internal processes and increases application and product competitiveness.

Delivering our promises globally

Our global presence provides you with reliable solutions and processes, consistent high quality, security of production and supply and delivery with precision. This commitment also means rapid response when product or application support is required and the very best in technical support.

Putting the care into chemicals

We take our responsibilities to heart and are committed to attentive, sustainable business practices. We minimize risks for our customers, our employees and the environment by working proactively to ensure safe products and processes.



Protecting product performance

Enhancing radiation curing

As the global leader in supplying high performance polyols and special products for radiation curing raw materials, we offer particular know-how and expertise. The extensive versatility of radiation curing technology makes it suitable for a wide range of applications in industrial coatings, graphic arts, electronics and adhesives.

Sustainable performance

Radiation curing technology is distinguished by excellent environmental compliance. Liquid coatings cure instantaneously without emissions and can be 100% VOC-free. Radiation curing technology also minimizes energy consumption and space requirements. Curing is fast and without heat so it can be applied to heat sensitive substrates and achieve end products that are highly resistant to physical and chemical assault.

Some of the main areas where Perstorp products are ideal for enhancing radiation curing are:

- Industrial coatings, in protective surface coatings for wood and plastics, anti-static coatings for CDs and DVDs, hard coats for displays and scratch resistant coatings for the automotive industry
- Graphic arts, in overprint varnishes and printing inks
- Optoelectronics for optical fibers, photoresists and printed circuit board
- Adhesives, such as structural adhesive for jewellery and plastic assembly, laminating adhesive for packaging and pressure sensitive adhesives

Polyols for acrylate monomers & oligomers

Radiation curing coatings and inks are typically composed of reactive diluents derived from the acrylic ester of our polyols and acrylate oligomers such as polyester and urethane acrylates

using our polyols as building blocks. Our polyols offer extensive design possibilities and allow you to develop raw materials for radiation curing coatings, inks and adhesives. We also offer a range of products for cationic radiation curing that is presented in a separate brochure.

Our products for radiation curing:

CTF, BEPD, NEO, TMP & Penta

Mono, di and multifunctional polyols as precursors for acrylate monomers or building blocks for oligomers

Alkoxylated polyols R-series

Di- to hexa-functional polyols for non skin-irritant acrylates, reactive diluents, oligomers and tailored properties

Di-TMP, Di-Penta & Boltorn™ dendritic polymers

High functionality polyols for acrylate monomers and oligomers of high reactivity and for improving durability of coatings and inks

TMPDE 80

Trimethylolpropane di-allyl ether for improved curing speed and reduced air inhibition of unsaturated polyesters in UV curing

Bis-MPA & Ymer™ N-120

Anionic and nonionic dispersing monomers for preparation of UV curable polyurethane dispersions (UV PUDs)

Capa™ & Oxymer™

Capa™ polycaprolactones, precursors for acrylate monomers, building blocks for UV PUDs and oligomers with low viscosity and high flexibility. Oxymer™ polycarbonate diols for preparation of UV PUDs or urethane acrylate oligomers with superior hydrolytical stability and outdoor resistance

HDI, IPDI, Scuranate™ TDI & Tolonate™

Isocyanate monomers and aliphatic polyisocyanates for urethane acrylates and building blocks for UV PUDs

We welcome your questions. More detailed information and specifications of each product are available on www.perstorp.com or through your Perstorp sales representative.



Fine-tuning with polyols

Delivering raw materials globally

We are the global leader in manufacturing and supplying basic polyols such as TMP (Trimethylolpropane), Penta (Pentaerythritol), and Neo (Neopentyl Glycol) as well as the more flexible and hydrophobic BEPD (Butyl Ethylpropane Diol). They are used in production of conventional acrylate monomers such as trimethylolpropane triacrylate or pentaerythritol tetraacrylate, and as building blocks for preparing polyester, urethane and amino acrylate oligomers.

CTF – specialty alcohol for low-odor, high Tg monofunctional acrylate monomer

When acrylated, CTF (Cyclic Trimethylolpropane Formal) is a unique monofunctional yet rigid alcohol that maintains higher curing speed and hardness and lower residual odor compared

Monoacrylate (8 wt% in a clear coat formulation)	CTF acrylate	Ethoxylated (2) phenol acrylate	IBOA	Lauryl acrylate
Adhesion on corona treated PE	0	1	1	2
Adhesion on corona treated OPP	1	3	1	2
Adhesion on Al	0	4	0	1

CTF acrylate best in its class of monofunctional acrylate for improving the adhesion of radiation curing coating on difficult substrates like PE, OPP or aluminium (from 0 to 5 where 0 is best)

to conventional monoacrylate monomers. As a monofunctional monomer, it improves the adhesion of coatings on plastic, ceramic, metal and other difficult substrates.

Alkoxyated polyols R-series – dedicated & safe

Our alkoxyated polyols R-series, including Polyol R2490, Polyol R3600 and Polyol R4631, is developed especially for radiation curing to meet raw material demands such as low glycol and low unreacted starting polyol. These products offer significant benefits, yielding acrylate monomers with no skin-irritation index, for safer handling.

Alkoxyated polyols R-series – polymeric grades

Several of the polyols in our R-series fulfill the REACH definition of a polymer and are therefore exempted from registration in REACH. The alkoxyates fulfilling the REACH definition of a polymer are:

- Polyol R3215
- Polyol R3430
- Polyol R4630
- Polyol R4631
- Polyol R6405



Polyol R2490 – for safety, durability & print quality

This diol yields monomers with excellent dilution power yet much lower irritation index, allowing Xi-free formulations in contrast to commonly used TPGDA and HDDA. The reactive diluent derived from Polyol R2490 increases the durability of protective coatings and improves the rheology control of inks for better print quality.

Precursors for low surface tension acrylates

Polyol R2395 has been developed for making diacrylate monomers with very low surface tension and high flexibility.

The acrylate of Polyol 3530 provides lower surface tension and improved wetting of plastic substrates.

Tri- & tetrafunctional polyols for superior properties

Polyol R3600 is a triol that is useful in preparing highly reactive triacrylate monomers for a variety of applications. Other trifunctional polyols, of various OH numbers and alkoxylation nature, customize basic properties such as hardness, flexibility, surface tension and wetting.

Polyol R3430 and Polyol 3215 are triols of increased molecular weight that provide both high flexibility and very low shrinkage. Polyol R4631, a tetrafunctional polyol for acrylate monomers, imparts high reactivity and scratch resistance.

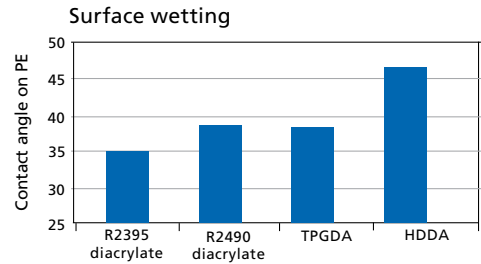
Polyol R6405 – our alkoxyated polyol with highest functionality

Polyol R6405 combines good diluting power, reactivity, low viscosity and good flexibility for superior end-product performance.

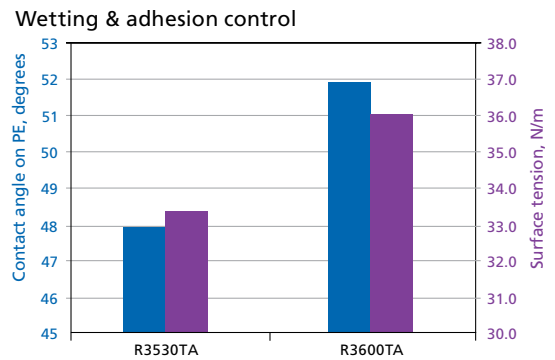
High-purity alkoxyates

Polyol R3540 is a high-purity polyol specifically designed for applications with high demands on high-purity products.

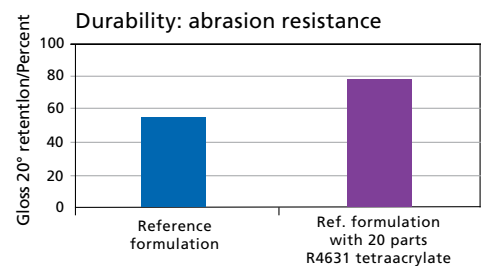
Polyol R4630 has been developed with higher purity for a lower extractable tetraacrylate monomer.



Best wetting of non-polar surface as 100 % on corona treated PE with R2395DA compared to other difunctional monomers – higher non-polar dispersing surface energy



The surface tension and contact angle on PE of the acrylates of trifunctional polyols, Polyol R3530 and Polyol R3600



Gloss 20° retention after 200 scrub scotch-brite test showing improved scratch resistance with the acrylates of polyol R4631

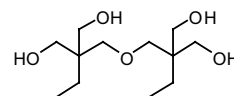
	Polyol R4631	Polyol R4630
Free polyol	0.2	<0.1
Sum EGs	<0.2	<0.1
Sum PGs	1.5–2.5	<0.1
Other low Mw impurities	3	<0.1

Exceptional advantages with Polyol R4630 in terms of low impurities for the most demanding applications where low extractable coatings are required

Designed to enhance

Di-TMP – high functionality & balanced properties

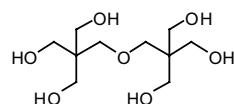
This tetrafunctional polyol provides low toxicity acrylate monomer with excellent pigment wetting behavior. It also improves reactivity and scratch resistance where low viscosity is required, making Di-TMP ideal for applications such as flexographic inks.



Di-TMP

Di-Penta – exceptional scratch resistance

Achieve the acrylate of the highest hardness and scratch resistance of all available high functionality polyols with Di-Penta. It is an essential component of hard coats and is important in securing the desired properties in end products such as polycarbonate headlamps and the protective coating of LCDs.



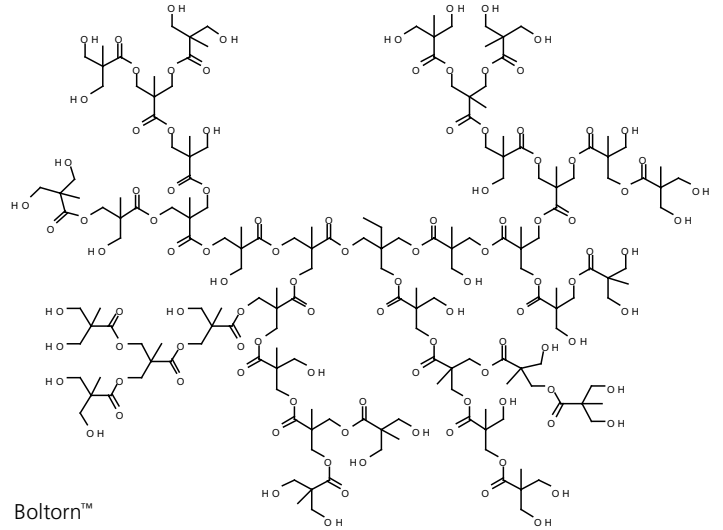
Di-Penta



Boltorn™ dendritic polymers – unique, versatile chemistry

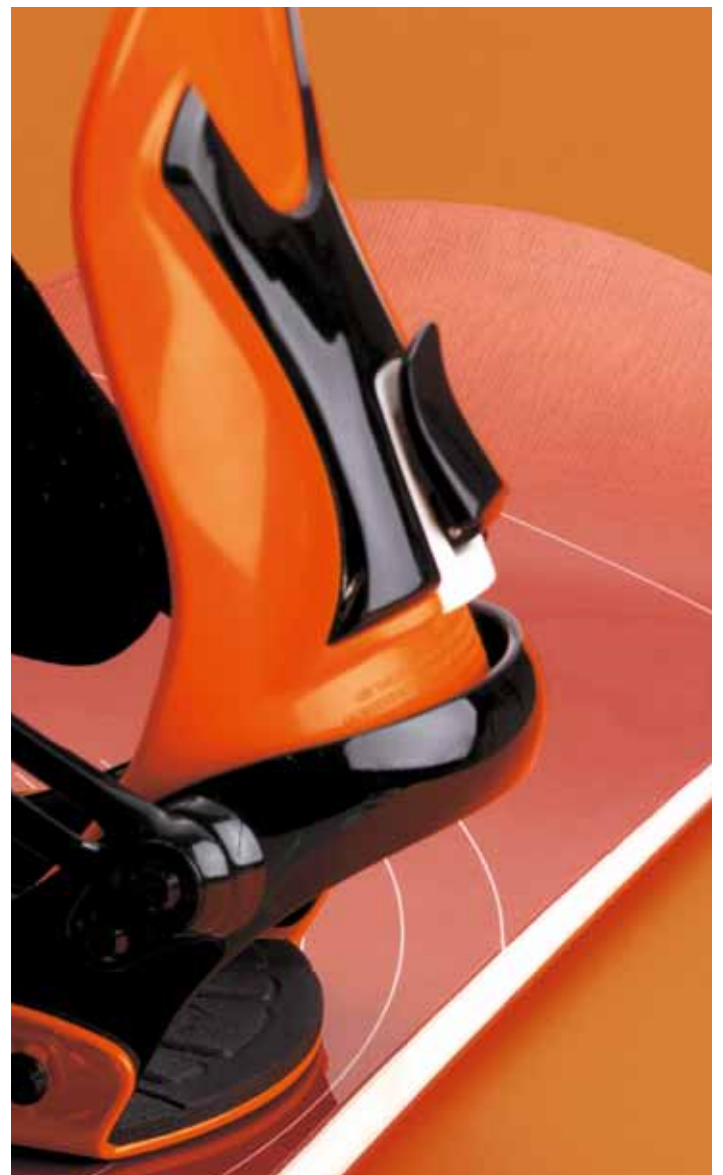
Our dendritic polymers are used as precursors for acrylate oligomers with high average molecular weight but also a high average acrylate concentration combined with a low intrinsic viscosity. The acrylate of Boltorn™ P500 achieves an ideal balance between viscosity, reactivity and flexibility for preparing a hard coat for plastics with enhanced adhesion and flexibility.

Boltorn™ P1000 is a low-viscosity polymer polyol allowing monomer-free formulation. It combines the low viscosity and low shrinkage required in applications such as UV digital printing.



Acrylated polyol type	Di-Penta acrylate (DPHA)	Acrylate of Boltorn™ P500
Viscosity, mPas, 100% solids, 23°	14,000	700
Min. UV-dose, tack-free, mJ/cm ²	200	200
Erichsen-flex., Aluminum, mm	0.4	2.2
Pencil hardness, PC- Sheet, 250µm	3H/4H	2H/3H
Scratch resistance, Steel wool #0000, PC-Sheet, 100 rubs, Gloss 20 ° ret.,%	99	99
Tape adhesion on PC-sheet, 0-5, 0 best	3	0
Adhesion, 180° bending test	No	OK

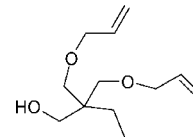
Di-Penta for best scratch resistance and Boltorn™ P500 for a better balance of hardness, flexibility and adhesion



Innovative performance

TMPDE 80 – allyl-ether for unsaturated polyester

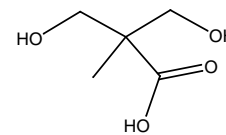
TMPDE 80 (trimethylolpropane di-allylether) is an essential element of unsaturated polyester for UV curing that decreases air inhibition. This results in better curing and productivity in the UV curing of wood surfaces.



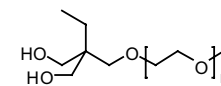
TMPDE 80

Specialty diols – for UV polyurethane dispersions

The range of applications for UV curable polyurethane dispersions (UV PUDs) has increased in recent years, for example in sprayable and low-gloss UV wood coatings. We are the leading supplier of Bis-MPA (2,2 dimethylolpropionic acid), a diol with an acidic group providing water dispersability for polyurethane dispersions after neutralization with a base. For nonionic stabilization of UV PUDs, Perstorp offers the nonionic diol Ymer™ N-120. These specialty diols can be combined with Oxymer™ polycarbonate macrodiols for enhanced hydrolytic stability and outdoor durability, or Capa™ polycaprolactone diols for maximum flexibility and improved abrasion resistance.



Bis-MPA



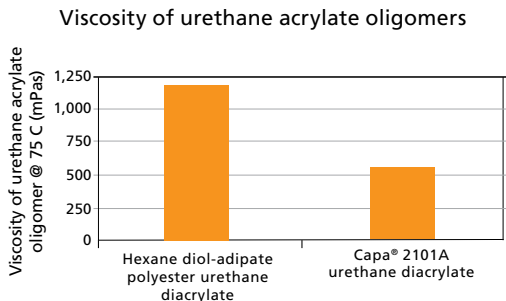
Ymer™ N-120



Caprolactones

Capa™ caprolactones – spearheading performance in products & processes

Capa™ is our range of caprolactones, comprising monomer and polycaprolactones of varying molecular weight and functionality. The Capa™ polycaprolactones display a very narrow molecular weight distribution, which results in very low viscosity products when compared to adipate polyesters, for example. The low viscosity of Capa™ is ideal for making low-viscosity acrylate oligomers, which can reduce the need for monomers in the final formulation. The Capa™ polycaprolactone diols can be used as macrodiols for UV PUDs, where they offer outstanding flexibility, good hydrolytical stability and outdoor resistance.



Isocyanates

Our range of isocyanate monomers and polyisocyanates is very suitable for preparing high-performance urethane acrylates using Perstorp polyols.

Scuranate™ TDI – polyurethane essentials

Scuranate™ TDI is used for aromatic urethane acrylates of high toughness and chemical resistance

HDI (Hexamethylene Diisocyanate) – for excellent flexibility

The aliphatic isocyanate monomer HDI provides excellent flexibility and outdoor durability

IPDI (Isophorone Diisocyanate) – a key resin building block

Urethane acrylates prepared with the cycloaliphatic isocyanate IPDI display exceptional weathering resistance, improved chemical resistance and toughness. IPDI has an improved hardness thanks to its rigid cycloaliphatic structure

Tolonate™ – for high-performance resins

Tolonate™ aliphatic polyisocyanates are used for low-viscosity urethane acrylates



Product data summary

Product	Appearance	OH-Functionality	Type of OH-group	Hydroxyl number mg KOH/g	Molecular weight, g/mol	Viscosity, mPas, (°C)
<i>Products for acrylic esters reactive diluents & building blocks for oligomers</i>						
CTF	Liquid	1	Primary	388	146	80 (23)
Neo	Solid/flakes	2	Primary	1,075	104	
BEPD	Semi-crystalline	2	Primary	695	161	50 (60)
Polyol R2395	Liquid	2	Secondary	395	276	350 (23)
Polyol R2490	Liquid	2	Secondary	490	220	170 (23)
Capa™ 2054	Liquid/paste	2	Primary	204	550	60 (60)
TMP	Solid/flakes	3	Primary	1,250	134	150 (80)
Polyol R3215	Liquid	3	Primary	215	795	340 (23)
Polyol R3430	Liquid	3	Primary	430	398	400 (23)
Polyol R3530	Liquid	3	Secondary	530	308	2,000 (23)
Polyol R3540	Liquid	3	Primary	540	310	550 (23)
Polyol R3600	Liquid	3	Primary	600	75	700 (23)
Capa™ 3031	Liquid	3	Primary	560	300	170 (60)
Capa™ 3050	Liquid	3	Primary	310	540	160 (60)
Capa™ 3091	Liquid	3	Primary	183	900	165 (60)
Penta	Solid/crystal	4	Primary	1,650	135	
Polyol R4630	Liquid	4	Primary	630	350	1,500 (23)
Polyol R4631	Liquid	4	Primary	631	356	1,500 (23)
Di-TMP	Solid/flakes	4	Primary	895	250	
Capa™ 4101	Liquid	4	Primary	218	1,000	260 (60)
Di-Penta	Solid/crystal	6	Primary	1,325	254	
Polyol R6405	Liquid	6	Primary	405	827	1,900 (23)
Boltorn™ H20	Amorphous/solid	16	Primary	495	2,100	7,000 (110)
Boltorn™ P1000	Liquid	Hydroxyl	Primary	470	1,500	5,000 (23)
Boltorn™ P500	Liquid	Hydroxyl	Primary	600	2,000	15,000 (23)

Product	Appearance	Functional groups	Hydroxyl number mg KOH/g	Molecular weight, g/mol	Viscosity, mPas, (°C)
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Products for unsaturated polyesters

TMPDE 80	Liquid	1 hydroxyl, 2 allyl	280	211	15 (23)
TMPDE 90	Liquid	1 hydroxyl, 2 allyl	265	214	20 (23)
BEPD	Semi-crystalline	2 hydroxyl	695	161	50 (60)

Product	Appearance	Functional groups	Hydroxyl number mg KOH/g	Molecular weight, g/mol	Viscosity, Pas, (°C)	Acid number mg KOH/g
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Products for UV PUDs

Bis-MPA	Crystal	2 hydroxyl, 1 carboxyl	835	134.4		415
Ymer™ N-120	Amorphous	2 hydroxyl	110	1000	0.06 (50)	

Product	Appearance	Functional groups	Hydroxyl number mg KOH/g	Molecular weight, g/mol	Viscosity, Pas, (°C)	Polymer chemistry
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Products for UV PUDs & acrylate oligomers

Oxymer™ M112	Viscous liquid	2 hydroxyl	112	1,000	20 (40)	Polycarbonate
Oxymer™ M56	Viscous liquid	2 hydroxyl	56	1,700	55 (40)	Polycarbonate
Oxymer™ C112	Viscous liquid	2 hydroxyl	112	1,500	40 (40)	Polycarbonate
Capa™ 2054	Liquid/paste	2 hydroxyl	204	550	0.06 (60)	Polyester
Capa™ 2101A	Paste/wax	2 hydroxyl	112	1,000	0.15 (60)	Polyester
Capa™ 2201A	Wax	2 hydroxyl	56	2,000	0.48 (60)	Polyester

Product	Isocyanate type	Hydrolysable chlorine (ppm)	Total chlorine (ppm)	Assay (%)
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Isocyanate monomers for urethane acrylates and UV PUDs

HDI (Hexamethylene diisocyanate)	Aliphatic	< 350	< 1,000	> 99.5
IPDI (Isophorone diisocyanate)	Cycloaliphatic	< 200	< 400	> 99.5
Scuranate™ T80 (Toluene diisocyanate, 80% 2,4 TDI)	Aromatic	< 70	< 300	> 99.5

Product	Isocyanate type	Viscosity, mPas, (25°C)	NCO (%)	Free monomer (%)	Solids content (%)	Equivalent weight (g)
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Polyisocyanates for urethane acrylates

Tolonate™ HDB-LV	Aliphatic	2,000 ± 500	23.5 ± 1.0	< 0.3	100	179
Tolonate™ HDT-LV2	Aliphatic	600 ± 150	23.0 ± 1.0	< 0.5	100	183



Your winning formula

The Perstorp Group, a trusted world leader in specialty chemicals, places focused innovation at your fingertips. Our culture of performance builds on over 125 years of experience and represents a complete chain of solutions in organic chemistry, process technology and application development.

Matched to your business needs, our versatile intermediates enhance the quality, performance and profitability of your products and processes. Present in the aerospace, marine, coatings, chemicals, plastics, engineering and construction industries, they can also be found in automotive, agricultural, food, packaging, textile, paper and electronics applications.

Our chemistry is backed by reliable business practices and a global commitment to responsiveness and flexibility. Capacity and delivery security are ensured through strategic production plants in Asia, Europe and North and South America, as well as sales offices in all major markets. Likewise, we combine product and application assistance with the very best in technical support.

As we look to the future, we strive for the development of safer products and sustainable processes that reduce environmental impact. This principle of innovation and responsibility applies not only to our own business, but also to our work with yours. In fulfilling it, we partner with you to create a winning formula that benefits your business – as well as the people it serves.

Discover your winning formula at www.perstorp.com