mat

a world of materials

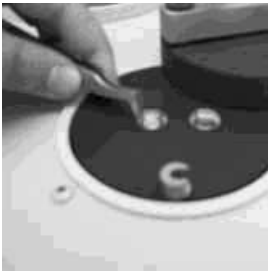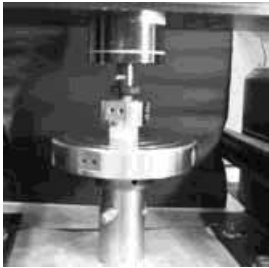# many products

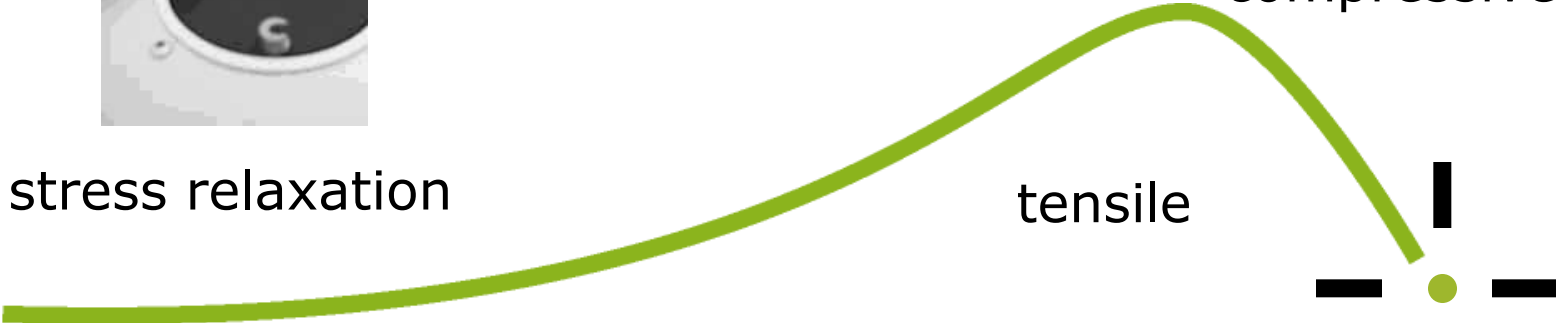# each with its own reality

material data
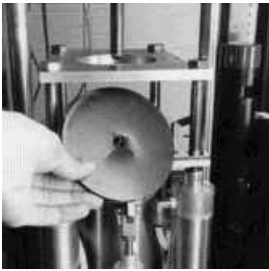
stress relaxation

compressive

tensile

viscosity   fatigue   conductivity   expansion

properties that describe reality

www.matereality.com
material databases for all

matereality

Material Databases that Serve Material Properties and Material Models

Hubert Lobo
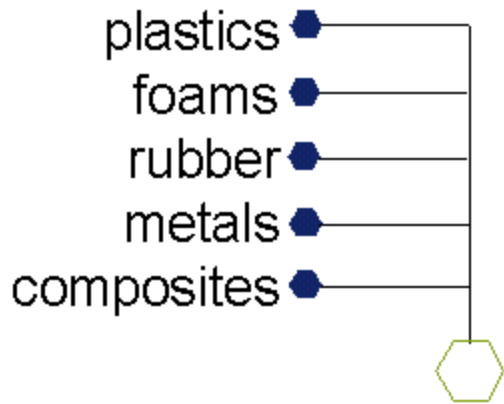
President + CTO

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Matereality & DatapointLabs

- DatapointLabs est. 1995
  - Expert material testing
  - Mechanical, thermal, rheology properties
  - *TestPaks* for CAE
- Matereality est. 2002
  - Web material database company
  - Databases for suppliers, OEMs, Tier n..
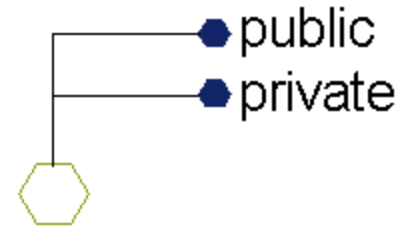 - Any material, any properties, one platform

Purpose

- A Web Platform shared by
  - material supplier tech support engineers
  - Automotive end user design engineers
- Web Software (SAS) to
  - Locate and request data
  - Deliver design properties
  - Deliver material models for diverse CAE

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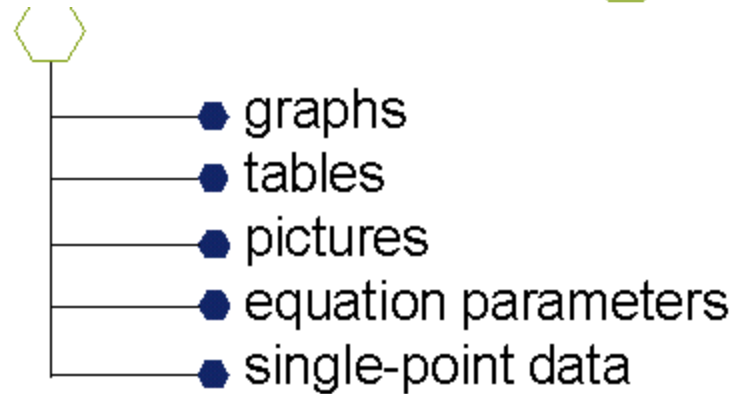# Matereality Databases

plastics
foams
rubber
metals
composites

public
private

Global Data Center

graphs
tables
pictures
equation parameters
single-point data

- Complete
- Extensible
- Traceable
- Shareable
- Secure

no limits!

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A variety of properties

Property Search

Class	Sub Class	Supplier
		Saint-Gobain

Material Properties Available

- ☐ Capillary Viscosity
- ☐ Charpy Impact
- ☐ Coefficient of Linear Thermal Expansion
- ☐ Compressive Creep
- ☐ Hardness
- ☐ Heat Deflection Temperature
- ☐ Instrumented Dart Impact

- ☐ Izod Impact
- ☐ Melt Elasticity
- ☐ Specific Heat
- ☐ Tensile Creep
- ☐ Tensile Properties
- ☐ Thermal Conductivity

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All data is traceable

Data Certificate
8586K162 > Tensile Properties

Technique	standards organization	ASTM
	standard number	ASTM D638-08
Sample Details	ID	15388
	sample source	client
Test Parameters	crosshead speed	5 mm/min
	extensometry	Axial - contact, 2" gage Class B-1
	gage length	50 mm
	laboratory humidity	51 %RH
	test temperature	-10 C
	test temperature	23 C
	test temperature	60 C
Specimen Details	conditioning	40 hours, 23C, 50%RH
	form	type I tensile bars
	other specimen preparation	machined plaque
	thickness	3.29 mm
	width	12.28 mm
Traceability	test laboratory	Datapoint Labs
	measurement date	8/6/2009
	accredited	Yes
	measurement instrument	Instron 8872 Servohydraulic UTM
	performed by	BL
	certified by	BC

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Global Collaboration

## UHMWPE Semi-transparent > Dynamic Mechanical Properties in Tension
Click on the property titles below to view data

Summarized Results

aT v. Temperature	Effect of sample atmosp
Modulus v. Time Mastercurve	Effect of sample atmosp

Individual Results

Modulus v. Time Mastercurve	sample atmosphere : A
aT v. Temperature	
Modulus v. Time Mastercurve	sample atmosphere : S
aT v. Temperature	
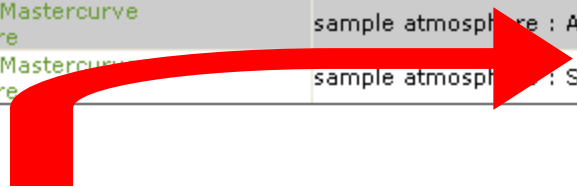
Share | Modify Access | Request Review | Discard | Tr

Share this Material Data
Part # 8539K13 > Tensile Properties

Email Address : john.brown@gm.com

use comma-delimiters for more than one recipient

Subject: Material Property Data from Confidential Demo Purposes
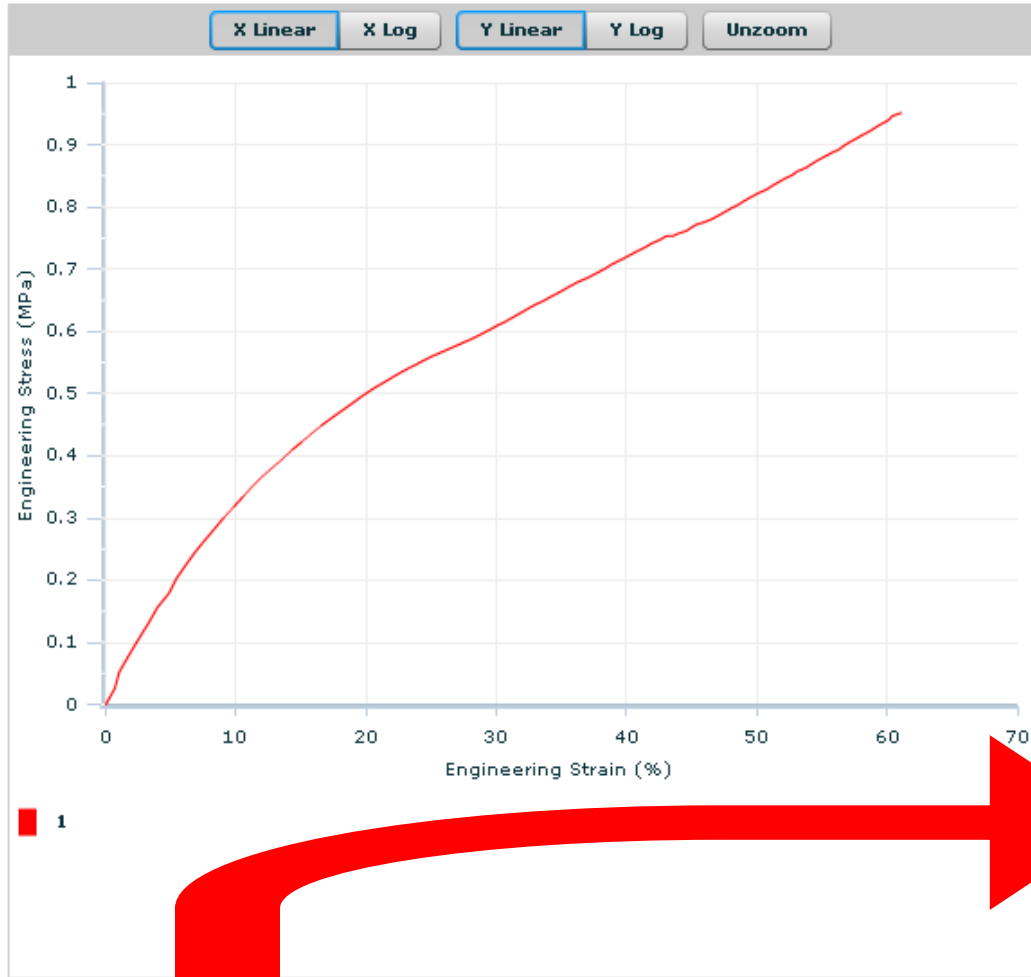
Message:

Here are the tensile properties you need.

☑ Grant recipient(s) access to this data (if recipient is a Matereality user)

The recipient will receive this link by e-mail. If they have access to Matereality, and you have given permission, they will be taken directly to this data. If they do not have a login, they will be invited to create one so that they can view this data.

Submit   Cancel

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Direct export to Excel

CAE Model Creation Process

- Locate raw data specific to a simulation
- Present raw data for inspection
  - Quality check
  - Traceability check
- Convert raw data to material model
- Model tuning
- Output material card

Search engine locates data

Raw data from testing

Engineering Tensile Stress-Strain Curves
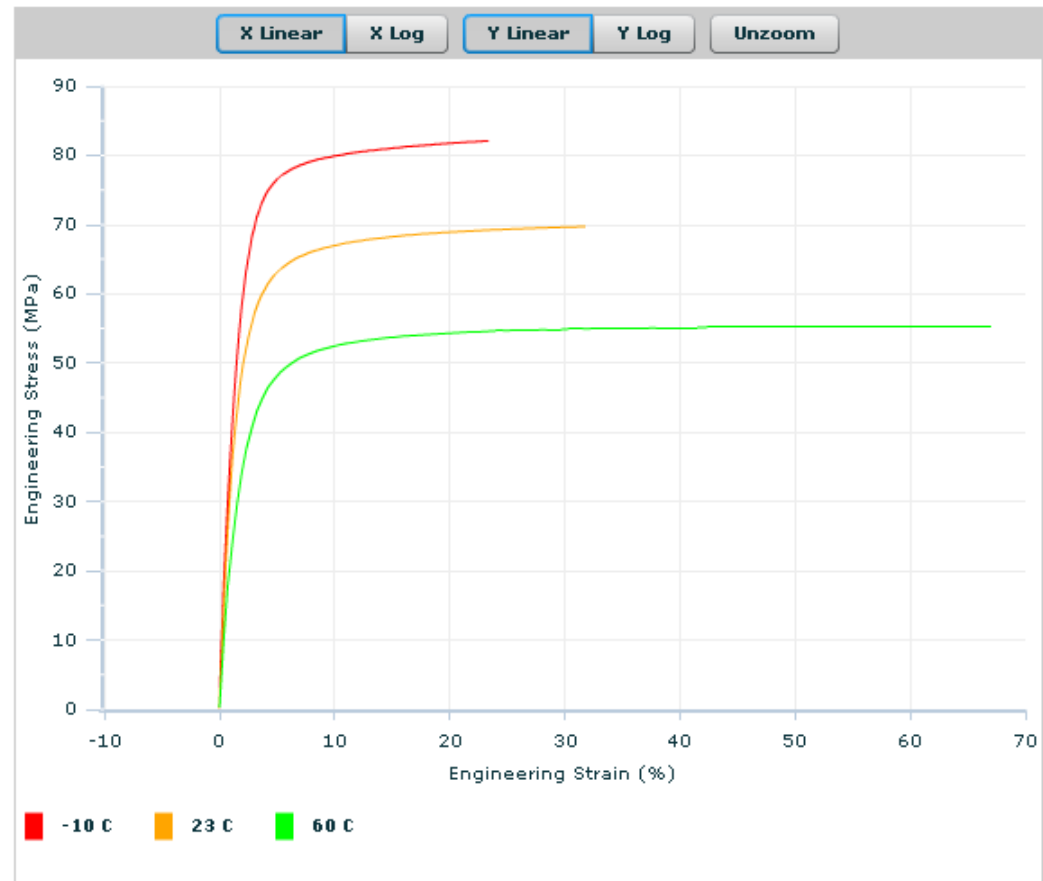
Post-processing and output

*Elastic

Temperature (C)	Modulus (MPa)	Poisson's Ratio
-10	3607.59123689013	0.2413
23	3183.7938807461	0.323571664399527
60	2174.59568965032	0.39415

*Plastic Plot
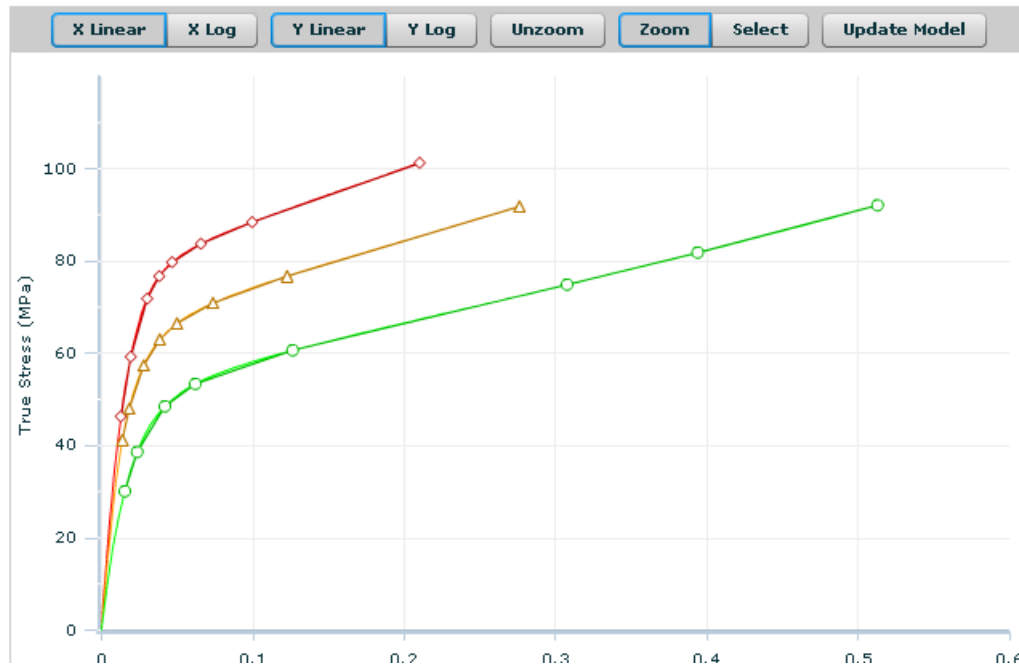

```
** Output generated by Matereality
** Abaqus Plastic Model
*MATERIAL, name=Delrin8753K13
*ELASTIC
3607.59123689013, 0.2413, -10
3183.7938807461, 0.323571664399527, 23
2174.59568965032, 0.39415, 60
****
*PLASTIC
46.381708640637, 0,-1.000E+01
59.3182190072696, 0.0028490427305577354,-1.000E+01
71.8736400512504, 0.01017006174294555,-1.000E+01
76.7156702762688, 0.016802750802138691,-1.000E+01
79.8204244473178, 0.0246331420035193,-1.000E+01
83.7520014704219, 0.042400203020399568,-1.000E+01
88.44580120706, 0.07511425176203515,-1.000E+01
101.286187380666, 0.18221125102592156,-1.000E+01
**
41.2027474277636, 0,2.300E+01
48.0138087197766, 0.0021790259049776321,2.300E+01
57.359137021248, 0.00867790936047107,2.300E+01
62.9873556601982, 0.017373626682723388,2.300E+01
66.4967793306663, 0.027568865979447788,2.300E+01
70.9009392980115, 0.05004465060490744,2.300E+01
76.72575710626, 0.096883146480115784,2.300E+01
91.876816291205, 0.24545717623947155,2.300E+01
**
30.11774647629, 0,6.000E+01
38.66825030697, 0.0039035831184979289,6.000E+01
48.5300393483556, 0.017108653508792655,6.000E+01
53.3730143012474, 0.03494428420354867,6.000E+01
60.661535633334, 0.095585277502911209,6.000E+01
74.9317547325, 0.26978649975467672,6.000E+01
81.885009651224, 0.35258702479111464,6.000E+01
92.151413540012, 0.46612695216059519,6.000E+01
**
```

Rubber materials

Hyper-elastic model output

SILICONE>Nastran MATHP

Nastran MATHP

MID	RHO	AV	TREF	GE	NA	ND
1		1			3	3

TEST DATA

| X Linear | X Log | Y Linear | Y Log | Unzoom | Zoom | Select | Update Model |
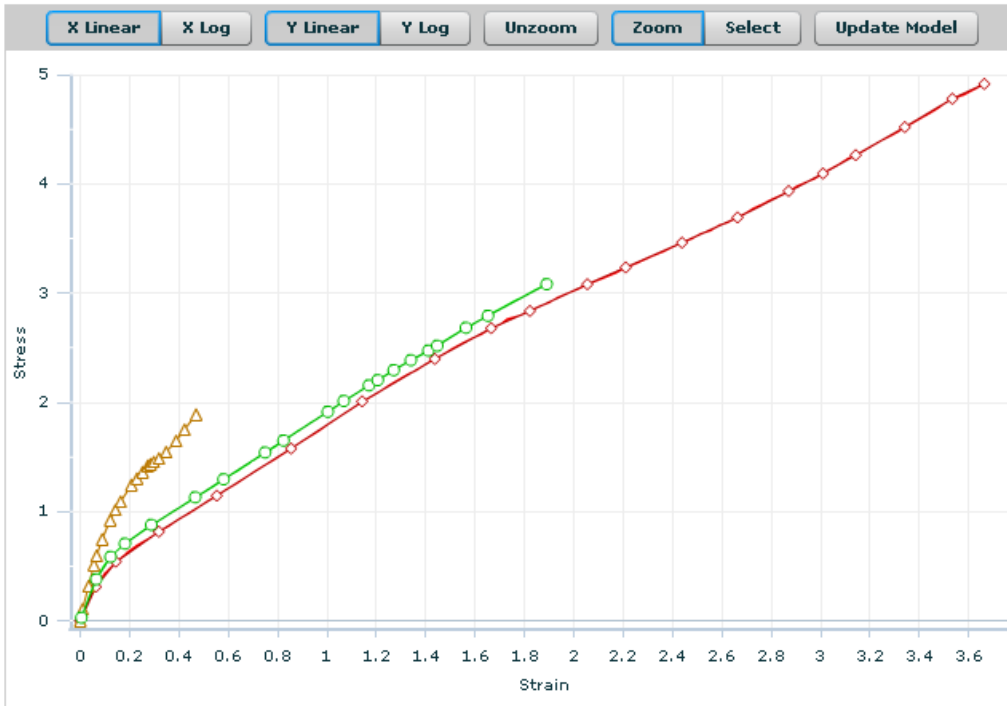

```
# Matereality Download
# Material Information
# Name: SILICONE
# Class: Rubber
# Subclass: Silicone Rubber
# Manufacturer: McMaster Carr
# SampleID: 11673
# SampleSource: client
# BEGIN MATHP (Hyperelastic Material Properties)
#
# MATHP, MID , A10 , AD1 , D1  , RHO , AV , TREF, GE  , [+]
# [+]   , [] , NA  , ND  , [] , [] , [] , [] , [] , [+]
# [+]   , A20 , A11 , A02 , D2  , [] , [] , [] , [] , [+]
# [+]   , A30 , A21 , A12 , A03 , D3  , [] , [] , [] , [+]
# [+]   , A40 , A31 , A22 , A13 , A04 , D4 , [] , [] , [+]
# [+]   , A50 , A41 , A32 , A23 , A14 , A05, D5  , [] , [+]
# [+]   , TAB1, TAB2, TAB3, TAB4, [] , [] , [] , TABD, []
#
# Uses TAB1-4 To calculate Aij & D1

MATHP,1,,,,,1.0E0,,,+
+,,3.0E0,3.0E0,,,,,,+
+,,,,,,,,,+
+,,,,,,,,,+
+,,,,,,,,,+
+,,,,,,,,,+
+,1301,1302,,1304,,,,

# BEGIN Uniaxial Test Data (Simple Compression/Tension)
TABLES1,1301,,,,,,,,+
+,1.1362-4,1.78-3,6.36D1-2,3.1231-1,1.4471-1,5.4138-1,3.1899-1,8.1615-1,+
+,5.5398-1,1.1472E0,8.543-1,1.577E0,1.1434E0,2.0085E0,1.4366E0,2.3983E0,+
+,1.6661E0,2.6811E0,1.8222E0,2.8377E0,2.0562E0,3.0832E0,2.2115E0,3.2348E0,+
+,2.4307E0,3.4646E0,2.6633E0,3.694E0,2.872E0,3.9331E0,3.01E0,4.0964E0,+
+,3.1435E0,4.2639E0,3.3418E0,4.5219E0,3.5349E0,4.78E0,3.6647E0,4.9142E0,+
```

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Injection-molding data

CALIBRE* 3031>Moldflow Data

Raw data is summarized below. Click on the property titles to view details.

Thermal Conductivity

Thermal Conductivity v. Temperature		

No-Flow Temperature

No-Flow Temperature	188 C	

Specific Heat

Specific Heat v. Temperature Data		
Transition End	131 C	
Transition Onset	141 C	
Transition Temperature	137 C	

Pressure-Volume-Temperature

Solid Density	1189.3 kg/m3	pressure : 0 MPa
Two Domain Tait Model		

Capillary Viscosity

Cross/WLF Model		

* Mold Surface T
* Melt Temperat
* Mold Temperat
* Melt Temperat
* Absolute

Mechani

Mechanical prope
in the fields below

File Download

Do you want to save this file?

Name: ...realityExport6329634254764864883[1].21000.udb
Type: Unknown File Type, 1.29 KB
From: servertwo

click the "Save button

[Save] [Cancel]

While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not save this file. What's the risk?

Elastic modulus, 1st principal direction (E1) _____ Pa

Elastic modulus, 2nd principal direction (E2) _____ Pa

Poissons ratio (v12) _____

Poissons ratio (v23) _____

Shear modulus (G12) _____ Pa

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High-strain rate tensile data

Makrolon 7435>LS-DYNA MAT_024 Data

Raw data is summarized below. Click on the property titles to view details.

Tensile Properties

Engineering Tensile Stress-Strain Curves		strain rate : 0.0692899615250087 /s
Engineering Tensile Stress-Strain Curves		strain rate : 0.266526757607555 /s
Engineering Tensile Stress-Strain Curves		strain rate : 2.66526757607555 /s
Engineering Tensile Stress-Strain Curves		strain rate : 26.6526757607555 /s
Eyring Plot		
Eyring Plot		
Poissons Ratio	0.4	strain rate : 0.0692899615250087 /s
Tensile Modulus	1992 MPa	strain rate : 0.0692899615250087 /s
Tensile Modulus	2171 MPa	strain rate : 0.266526757607555 /s
Tensile Modulus	2148 MPa	strain rate : 2.66526757607555 /s
Tensile Modulus	2417 MPa	strain rate : 26.6526757607555 /s

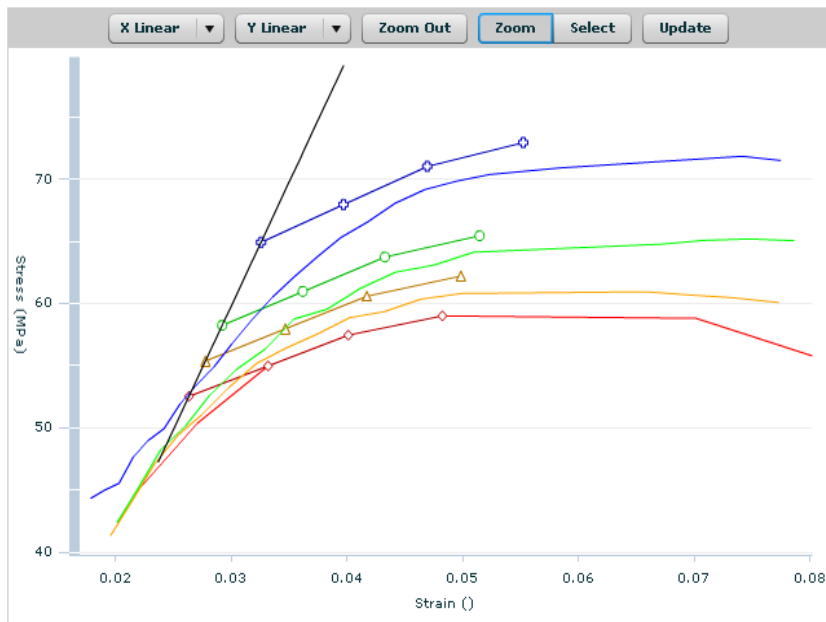Export

MAT 24 automated data fit
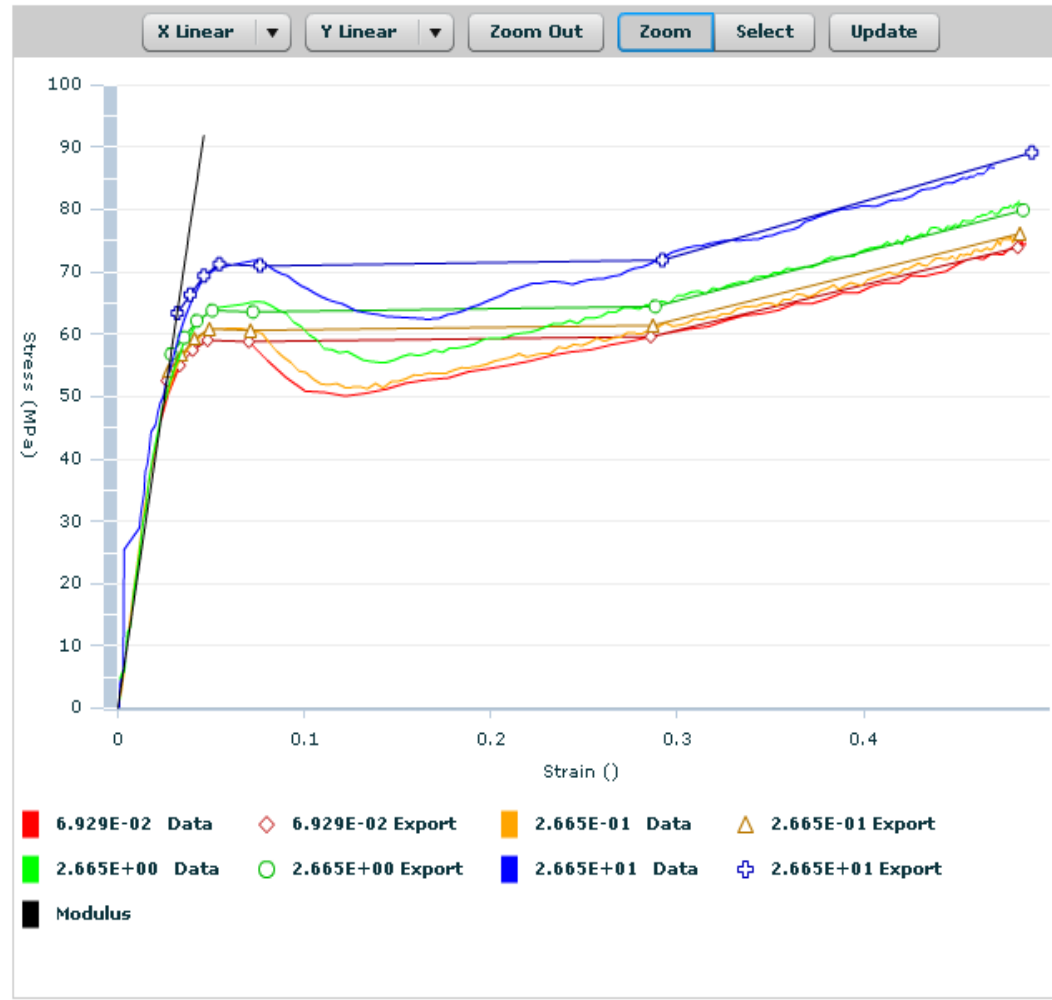
Rate dependency tuning

Modeling post-yield & failure

lcsr

Writing the .dyn file

Ls-Dyna MAT_024 (LCSR)

LS-DYNA MAT_024

mid	ro	e MPa	pr	sigy	etan	fail	tdel
10025	1e9	1991.836425	0.4	51		73	

c	p	lcss	lcsr	vp
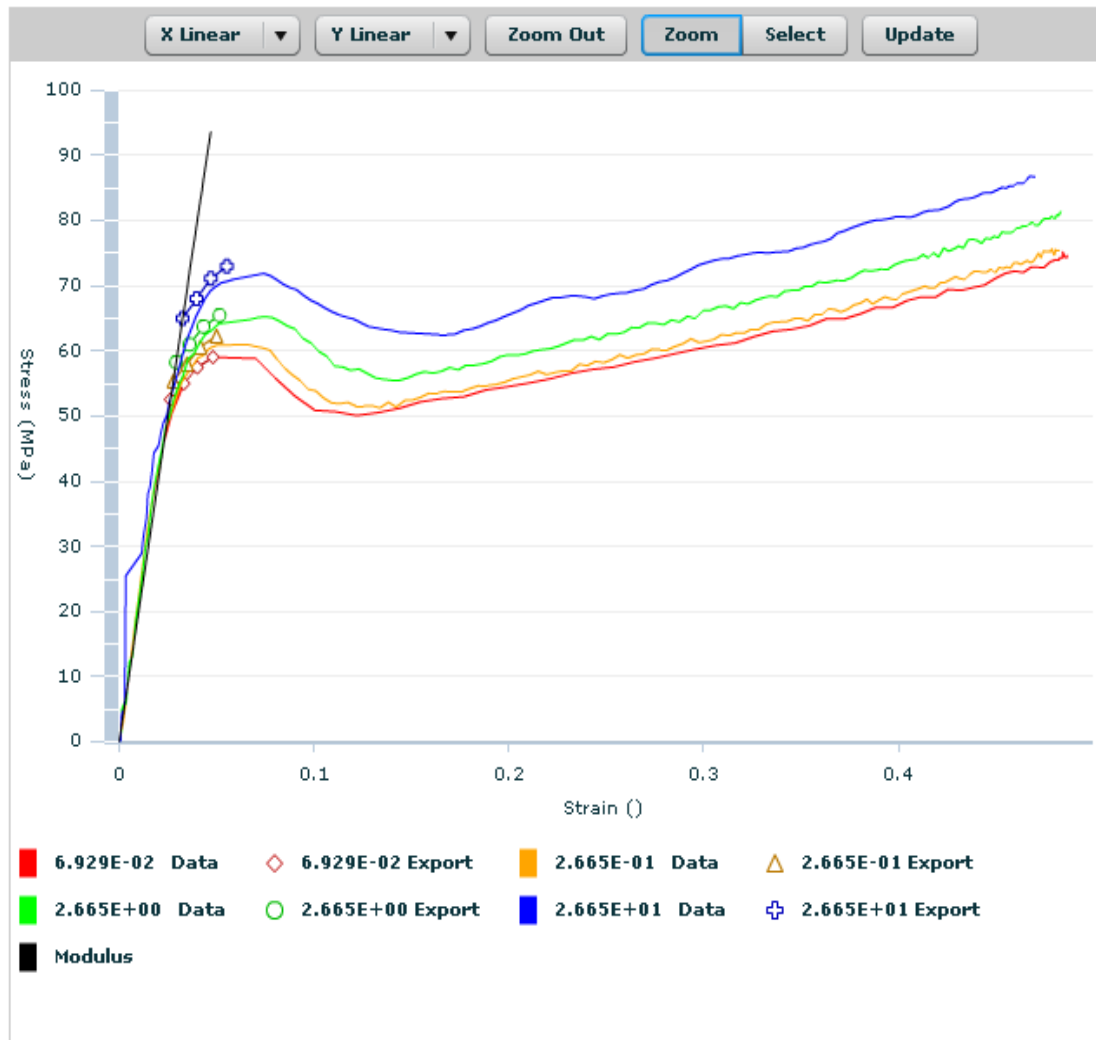
LCSR

Strain Rate (/s)	Stress Ratio
0.06929	1
0.2665	1.0305054545454546
2.665	1.081002509090909
26.65	1.2063636363636363

lcsr
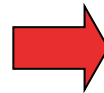
```
*MAT_024
$#      mid         ro          e         pr       sigy       etan       fail       tdel
       10025   1.0E+09  1.992E+03    4.0E-01    5.1E+01    0.0E+00    7.3E+01    0.0E+00
$#        c          p       lcss       lcsr         vp
                                        1002    0.0E+00
$#      eps
 5.608E-03 1.131E-02 1.864E-02 4.065E-02 2.561E-01 4.458E-01
$#       es
 5.497E+01 5.746E+01 5.901E+01 5.882E+01 5.958E+01 7.387E+01
*DEFINE_CURVE_TITLE
lcsr
$#     lcid       sidr        sfa        sfo       offa       offo
       1002          0    1.0E+00    1.0E+00    0.0E+00    0.0E+00
$#               A1                    O1
            6.929E-02               1.0E+00
            2.665E-01               1.031E+00
            2.665E+00               1.081E+00
            2.665E+01               1.206E+00
```

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Supported Software

- ABAQUS
- ANSYS
- Autodesk Algor
- Autodesk Moldflow
- LS-DYNA
- Moldex3D
- Matlab
- PAM-CRASH
- NX Nastran

Conclusion

- Web-Platform to store any material data
- Web-Software to convert data to
  - Elastic-Plastic cards for plastics
  - Crash material cards for CAE
  - Hyperelastic cards for rubber materials
  - Injection-molding simulation inputs
  - NASTRAN input decks
- Many CAE software supported

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