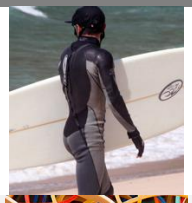
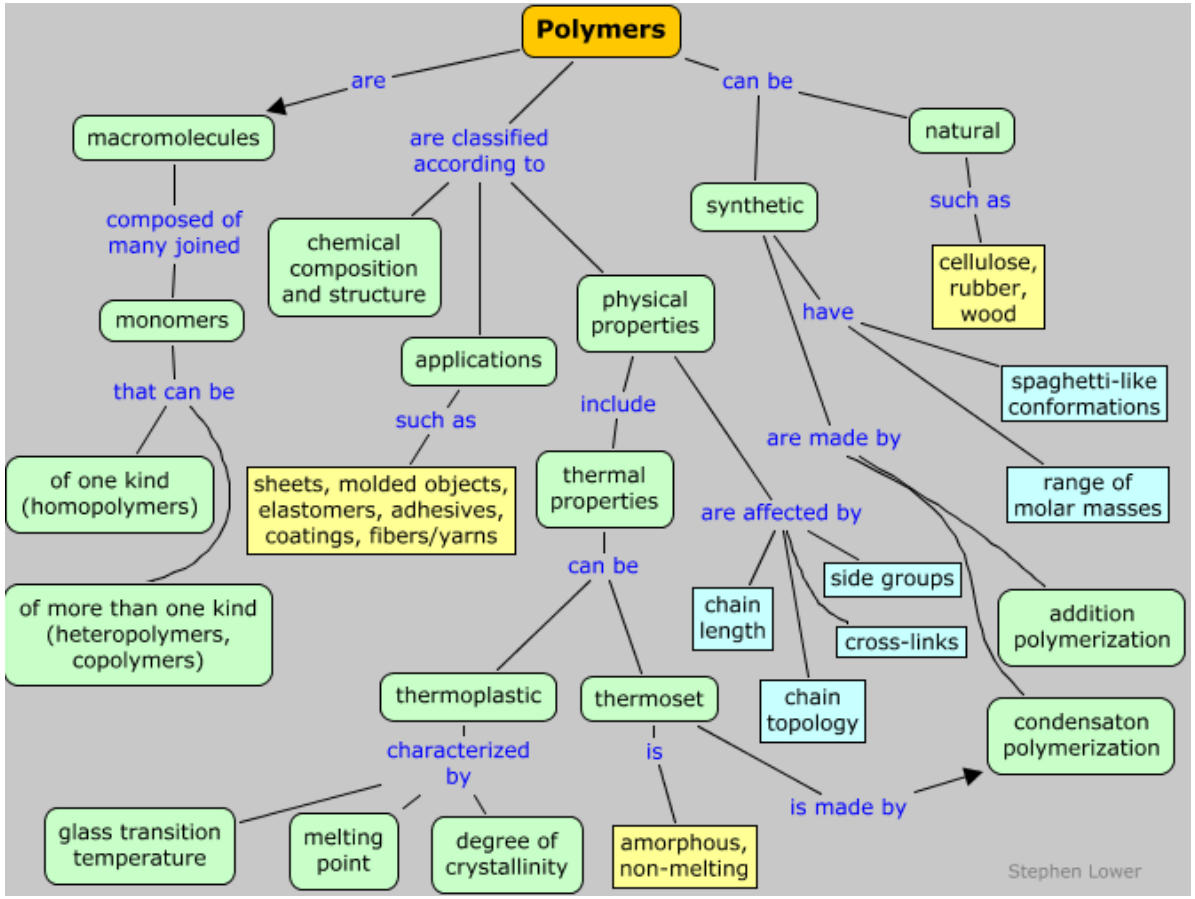
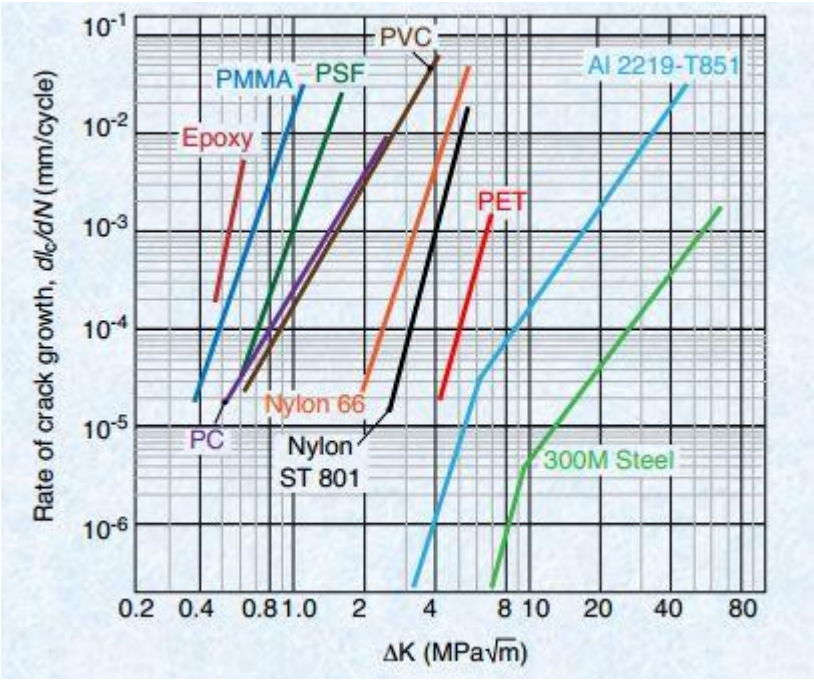
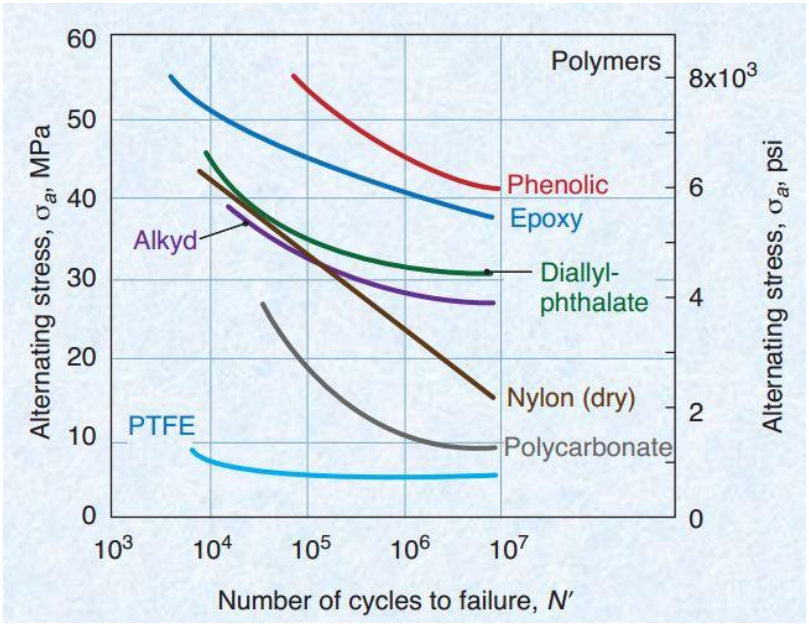
Summary of Basic Mechanical Properties of Polymers

Material	Price (€/kg)	$\rho\ (kg/m^3)$	E (GPa)	σ_e (MPa)	Elongation (%)	Max Service Temp. (°C)	Applications	Other info
Thermoplastics								
Nylon	3,6	1130	2,9	70	30-100	110-140		Nylon is the generic name given to the polyamide family.
PP (Polypropylene)	1,3	900	1,2	30	100-600	105		Great resistance to salt water and sun. The most used polymer for consumer products.
PE (Polyethylene)	1,4	950	0,75	24	200-800	100		There are high, medium and low density (HDPE, MDPE, LDPE).
PMMA (acrylic)	2,1	1200	3	63	2-10	50		It's the thermoplastic that resembles glass the most.
ABS	2,0	1100	2	19-50	2-100	70		Good dimensional stability.
PVC	1,1	1450	3	35-52	12-80	65		Along with PP it's one of the cheapest and most versatile thermoplastics reason why it's also one of the most widely used.
PC (Polycarbonate)	3,7	1200	2,2	65	70-150	100-140		It's one of the engineering thermoplastics meaning it has better mechanical properties than the others.
Teflon	11,5	2200	0,5	20	260	200-400		Low friction, hydrophobic, chemically and thermally stable.

PET (thermoplastic polyester)	1,6	1350	3	60	67-90	30-300		Good resistance to water. Transparent.
PU (Polyurethane)	4,5	1150	1,6	45	60-500	65-80	 	Also exists in elastomeric and thermosetting version. Can be easily turned into foam to make good thermal insulators.
Thermosetting								
PF (Phenolic resins)	1,3	1300	3,5	39	2	215	Electrical components, or subject to high temperatures such as glues.	
Epoxy	2,6	1100-1400	2,5	36-71	2-10	140-180	Widely used as matrix for composite materials.	Good mechanical, adhesive and electrical properties. Good heat and chemical stability.
Polyester resin	1,8	1000-1400	3	35	2,5	130-150		
Elastomers								
Neoprene	4,5	1240	0,001	3,5-25	100-800	105		Good thermal insulator, chemical stability and resistance to water and sun.
Natural rubber	3,2	920	0,002	25	500-800	70-110		More than 50% of all elastomers made derive from natural rubber.
Silicone rubber	8,5	1300-1800	0,01	3	80-300	230-290		Good insulators and chemical stability.


Polymers
are
can be
macromolecules
are classified according to
natural
composed of many joined
monomers
that can be
of one kind (homopolymers)
of more than one kind (heteropolymers, copolymers)
chemical composition and structure
applications
such as
sheets, molded objects, elastomers, adhesives, coatings, fibers/yarns
physical properties
include
thermal properties
can be
thermoplastic
thermoset
characterized by
glass transition temperature
melting point
degree of crystallinity
is
amorphous, non-melting
synthetic
such as
cellulose, rubber, wood
have
spaghetti-like conformations
range of molar masses
are made by
addition polymerization
condensaton polymerization
are affected by
chain length
side groups
cross-links
chain topology
is made by
Stephen Lower


Rate of crack growth, dl_c/dN (mm/cycle)
ΔK (MPa√m)
PVC
PMMA
PSF
Al 2219-T851
Epoxy
PET
Nylon 66
PC
Nylon ST 801
300M Steel


Alternating stress, σa, MPa
Alternating stress, σa, psi
Number of cycles to failure, N′
Polymers
Phenolic
Epoxy
Alkyd
Diallyl-phthalate
Nylon (dry)
PTFE
Polycarbonate