Thiol-ene Polymers, Harnessing the Power of the Sun

UV-Polymerization is best known for applications in:

Automotive, electronics, contact lenses, floor coatings.

A thiol group consists of a   _____

An ene group consists of a   _____

The thiol-ene reaction is a type of _____

_____ is known to be modular, produce high yields, no offensive by products.

Thiol-ene materials are easily processed in the bulk, requiring no solvents.

One disadvantage of thiols are their _____!

Thiols are used to _____.

UV-Polymerization is a green manufacturing process and benefits from being easy to apply, energy efficient, eco-friendly, fast curing, solvent free, no VOCs.

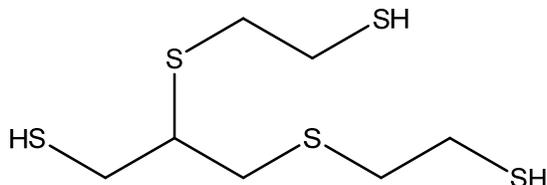When making UV-Cured polymers, a _____ starts the reaction.

Let's make some thiol-enes!

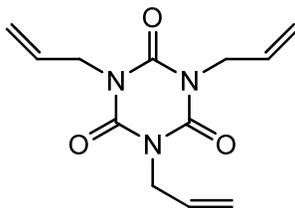Thiol-ene polymers require a _____ ratio of thiol to ene.

If we start with 2.5 grams of thiol, how many grams of ene do we need?

The thiol we will be using is DMPT:

DMPT has ___ reactive thiol groups. Circle them.

The ene we will be using is TTT:

1,3,5-Triallyl-1,3,5-triazine-2,4,6(1*H*,3*H*,5*H*)-trione

TTT has ___ reactive ene groups. Circle them.

How many of each component do we need?

Think of moles similar to how a dozen represents _____ of something.

A mole is _____ of something.

This number is known as _____.

Think about it!

If we have a dozen spiders that need shoes, how many shoes do we need?

If we have a mol of spiders, how many shoes do we need?

Apply this to science!

If I have 1 mol of DMPT which has _____ thiols, how many enes do I need?

Let's use a simplified equation!

$$f_{Thiol}(M_{Thiol}) = f_{ene}(M_{ene})$$

Where f_{Thiol} is the functional groups in our thiol

M_{Thiol} is the number of moles of thiol monomer.

f_{ene} is the functional groups in our –ene.

M_{ene} is the number of moles of our –ene.

We now know how many TTTs we need, how do we measure this in the lab.

Convert moles to something we can measure!

What units do we have? _____

What units do we need? What can we measure easily? _____

Each chemical has a molecular weight which describes how many moles are in each gram of that chemical.

Molecular weight has a unit of: _____

Let's apply it!

I have 2.5 grams of DMPT how many moles do I have?

How many functional groups do I have?

How many functional groups does TTT have?

How many moles of TTT should I have to match the thiol groups?

How many grams do I need of TTT?

To the mixture of DMPT, we add 1% photo initiator.

What is our total mass of DMPT+TTT? _____

What is 1% of DMPT+TTT? _____

Making Thiol-enes by UV-Polymerization!

Record your calculated mass from the previous page. Record the actual masses you measure in the lab.

Mass of DMPT

Calculated: _____

Actual: _____

Mass of TTT

Calculated: _____

Actual: _____

Mass of Photo Initiator

Calculated: _____

Actual: _____

Characteristics of the material:

_____

_____

_____

_____

_____

_____