

Rapidly screen candidate polymers for a wide range of properties

Works with repeat unit libraries or novel user-defined units

Prioritize candidate polymers for synthesizing and testing

Synthia

Synthia calculates polymer properties using advanced Quantitative Structure-Property Relationships (QSPRs). It allows researchers to rapidly screen candidate polymers for a wide range of properties, and allows the property prediction of copolymer blends.

What does Synthia do ?

Synthia uses pre-defined correlations to evaluate a wide range of polymer properties. Using these empirical correlation methods, large numbers of polymers, or copolymers of varying composition, can be rapidly screened for desired properties. QSPR methods are fast, provide large numbers of properties, and are the easiest modeling tool to use.

Understanding quantitative structure-property relationships helps chemists to prioritize candidate polymers for synthesis and testing. Previous QSPR approaches have relied on statistical interpolation from observed structure-property relationships using functional group contribution methods. These approaches restricted property prediction to those polymers comprised of a specific set of known chemical groups.

Synthia is a significant advance in QSPR. Synthia uses topological information - specifically, connectivity indices derived from graph theory - and so is essentially based upon individual atoms and bonds. With no database of functional group contributions required, properties can be predicted for polymers comprised of the nine elements: carbon, hydrogen, nitrogen, oxygen, silicon, sulfur, fluorine, chlorine, and bromine.

Synthia is based on work conducted by Dr. Jozef Bicerano of The Dow Chemical Company, where the methodology has been extensively tested in practical work.

The Materials Studio advantage

MS Modeling, Material Studio's modeling and simulation suite, runs as a Windows® client on your PC, and provides a comprehensive

	A	B	C	D	E	F	G	H
	Monomer 1	Mass fraction 1	Monomer 2	Mass fraction 2	Temperature	Molecular weight	Repeat unit molecular weight (Cofree)	Repeat unit length (Cofree)
1	Ethylene	0.00000000	Styrene	1.00000000	298	1.000000e+005	44.0534813	3.122721
2	Ethylene	0.00000000	Styrene	1.00000000	298	1.000000e+005	30.0263871	2.198894
3	Ethylene	0.10000000	Styrene	0.90000000	298	1.000000e+005	42.4534808	3.081234
4	Ethylene	0.10000000	Styrene	0.90000000	300	1.000000e+005	42.4534808	3.081234
5	Ethylene	0.20000000	Styrene	0.80000000	300	1.000000e+005	42.4534808	3.081234
6	Ethylene	0.20000000	Styrene	0.80000000	300	1.000000e+005	42.4534808	3.081234
7	Ethylene	0.30000000	Styrene	0.70000000	300	1.000000e+005	42.4534808	3.081234
8	Ethylene	0.30000000	Styrene	0.70000000	300	1.000000e+005	42.4534808	3.081234
9	Ethylene	0.40000000	Styrene	0.60000000	300	1.000000e+005	42.4534808	3.081234
10	Ethylene	0.40000000	Styrene	0.60000000	300	1.000000e+005	42.4534808	3.081234
11	Ethylene	0.50000000	Styrene	0.50000000	300	1.000000e+005	42.4534808	3.081234
12	Ethylene	0.50000000	Styrene	0.50000000	300	1.000000e+005	42.4534808	3.081234
13	Ethylene	0.60000000	Styrene	0.40000000	300	1.000000e+005	42.4534808	3.081234
14	Ethylene	0.60000000	Styrene	0.40000000	300	1.000000e+005	42.4534808	3.081234

Synthia results are stored in a study table allowing you to store, plot, or sort results using the study table tools. Monomers can be edited in the study table and their properties updated giving you a fast method of screening new repeat units.

range of software tools. Flexible client/server computing harnesses the power of a range of server technologies, to access leading methods in computational chemistry and materials science, delivering results direct to your desktop. The introduction of Synthia into this toolkit makes it easy to take advantage of the existing functionality of Materials Studio, such as the study table document. The comprehensive spreadsheet-like environment is used for accessing, comparing and analyzing results, and allows the storage of all predictions, making it easy to track work. Polymer property data can be plotted using the integral charting tools or pasted into other Windows productivity tools, allowing for easy communication of results.

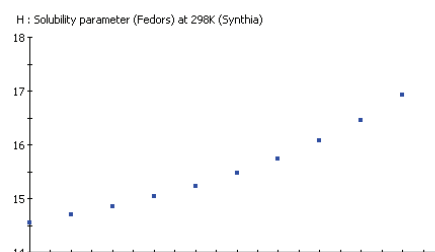
The 3D representation of each polymer repeat unit structure can be found by clicking on the monomer cell. The large numbers of polymer repeat units stored in libraries in MS Modeling means you may not even have to sketch your polymer of interest; however if the required repeat unit is not in the standard library, Materials Studio's advanced sketching tools make it a

matter of following a few simple steps to sketch novel units and add them to your library.

Synthia can be used to predict properties for a single repeat unit, a series of homopolymers, or complex random copolymers. All this functionality is accessed from a single, simple, graphical user-interface.

Features

- Rapidly estimate polymer properties by using empirical methods
- Predict a wide range of thermodynamic, mechanical, and transport properties for bulk amorphous homopolymers and random copolymers
- Make predictions for polymers so novel that the properties of interest are not documented
- Use study tables and charts to examine results for both homopolymer and copolymer calculations
- Use the study table, with the structural descriptors and a QSAR license, to generate custom correlations,
- Calculate the following types of properties:
 - Structural properties
 - Thermophysical properties
 - Electrical, optical, and magnetic properties
 - Mechanical properties
 - Chain stiffness and entanglement properties
 - Transport properties.



A plot of the mole fraction dependence of solubility parameter for a random copolymer consisting of two different monomer units. These complex properties can be obtained quickly and easily using the Synthia module.