

Product datasheet (en)

Version: 1702_14.04.2014

Photo:

Name:



leXsolar-BioFuel Large

Item number:

1702

Youtube link:

Area of application:

Chemistry
Technology Training

Dimensions (cm x cm x cm):

42x35x15

Weight (kg):

4,00

User group:

Highschool / Secondary School

Key facts:

Production of biofuel displayed in experiments for students
Covers bioethanol and biodiesel production
Interdisciplinary experiments for chemistry, physics and biology
Includes an Ethanol-fuel cell for the generation of electrical energy out of biofuel

List of components:

1 x 1100-23 Potentiometer module
1 x 1100-27 Motor module without gear
1 x 1700-01 leXsolar ethanol fuel cell module
1 x 1702-01 Plug with hose
1 x 1702-02 Yeast
1 x 1702-03 Box 1702
4 x L2-02-016 Bump on transparent 5,0 mm height X 11,1mm diameter
1 x L2-02-017 Yellow propeller
1 x L2-06-016 Laboratory thermometer
1 x L2-06-070 Distilling head, 2 cores 75°, NS 19/26
1 x L2-06-071 Condenser
1 x L2-06-072 Alcoholmeter
1 x L2-06-075 Erlenmeyer flask 1000 ml
1 x L2-06-076 Airlock
1 x L2-06-077 Rubber stopper
1 x L2-06-079 Areometer
1 x L2-06-082 Beaker 250 ml
3 x L2-06-083 Test tubes
1 x L2-06-084 Grip stopper
3 x L2-06-085 Pasteur pipette
1 x L2-06-086 Measuring cylinder 100ml
1 x L2-06-087 Syringe 2ml
1 x L2-06-110 Silicone ring
1 x L3-01-013 Lid for tray
1 x L3-01-078 Padding "BioFuel-Large"
1 x L3-03-016 leXsolar-CD
1 x L3-03-142 Einräumplan 1702 BioFuel Large

Extras needed:

1 x 1700-02 Chain clamp
1 x L2-06-118 Stand base plate
1 x L2-06-114 Bunsen burner
1 x L2-06-116 Universal stand clamp
1 x L2-06-119 Stand rod 60cm, M10
2 x L2-06-120 Double clamp
1 x 9100-03 AV-Module
2 x L2-06-012 Test lead black 25 cm
2 x L2-06-013 Test lead red 25 cm

Extras available:

No extras available.

Description:

The entire process of producing biofuels can be demonstrated with leXsolar-BioFuel Large. It starts with the biological step of alcoholic fermentation. Afterwards the produced mash will be distilled with the help of the leXsolar-condenser, which was developed just for this experiment. The last step demonstrates the conversion of the produced biofuel into usable energy, such as electrical energy, using the provided Ethanol-fuel cell. leXsolar-BioFuel Large does not only cover the topic of the production of bioethanol, but also the production of biodiesel through transesterification of fats.

Experiments:

Part 1: Biodiesel production

Transesterification from fat to Biodiesel (FAME)
Determination of fat parameters
Extraction of fats from foods and oil plants

Part 2: Alcohol fermentation

Production of a mash/ alcoholic fermentation
Fermentation of different sugar types
(including catalytic splitting of starch)
Proof of fermentation gases

Part 3: Distillation and production of Bioethano

Distillation of mash
Characteristics of the produced Ethano

Part 4: Ethanol fuels

Introduction Ethanol fuel cell
I-V curve of Ethanol fuel cells
Dependency of Ethanol fuel cells on concentration and temperature
Energy balance of the whole process

Specifications of components:

1100-23 Potentiometer module:

Plug-in module with adjustable resistance
Resistance continuously adjustable: 0 - 1.1 kOhm
Maximum current: 1A
Module contains two potentiometers connected in series (1 x 100 Ohm and 1 x 1 kOhm)
Allows an exact adjustment of the resistance while having a large resistance range
Layout: plug-in module with 4mm jacks
Grid-dimension of the jacks: 70mm
Module size: 85mmx85mm

1100-27 Motor module without gear:

Plug-in module with DC-motor
Initial current: 20 mA
Initial voltage: 0.35 V
Equipped with automatic fuse protecting from overvoltage

Layout: plug-in module with 4 mm jacks
Grid-dimension of the jacks: 70 mm
Module size: 85 mm x 85 mm

1700-01 leXsolar ethanol fuel cell module:
Ethanol fuel cell for conversion of chemical energy into electrical energy
Stack of two fuel cells with separately contactable single fuel cells
For ethanol solution with concentration up to 20%
Recommended ethanol concentration for continuous operation 10%
Open circuit voltage $V_{oc} = 1$ V (double cell)
Maximum short circuit current $I_{sc} = 40$ mA
Maximum peak power $P = 10$ mW
Approx. continuous power $P = 2$ mW (at least 2 min.)

1702-01 Plug with hose:
'Stopper (PE) for Erlenmeyer flask L2-06-075 pierced with PE-tube
Joint: ST/NS 29/32
To be used for detection of carbon dioxide

1702-02 Yeast:
Yeast for producing ethanol solutions up to 18% in 48 hours
contains nutrient salt

L2-02-016 Bumpon transparent 5,0 mm height X 11,1mm diameter:

L2-02-017 Yellow propeller:

L2-06-016 Laboratory thermometer:
Alcohol laboratory thermometer with red liquid. White occupied capillaries, amber stain graduation, Length according to ISO 305 mm, 6mm \varnothing , with suspension eye, packed in a protective plastic holder, measurement range: $-10..+ 110^{\circ}\text{C}$, graduation: 1°C

L2-06-070 Distilling head, 2 cores 75° , NS 19/26:
Fractionating column with 2 joints NS 29/32 and GL14 fitting for thermometer L2-06-016

L2-06-071 Condenser:
Condenser for distillation of ethanol
Joint: NS 29/32 for Erlenmeyer flask L2-06-075
No need for cooling water circuit
Distillation of approx. 750ml with one cooling water charge possible

L2-06-072 Alcoholmeter:
Alcoholometer for measuring the concentration of ethanol solutions
For concentration of 30 - 90 vol.%

L2-06-075 Erlenmeyer flask 1000 ml:
Erlenmeyer flask 1000 ml with joint NS 29/32
Borosilicate glass

L2-06-076 Airlock:
Airlock for fermentation

Together with stopper L2-06-077 to be used with erlenmeyer flask L2-06-075

L2-06-077 Rubber stopper:
Rubber stopper for NS 29/32 with hole for air lock L2-06-076

L2-06-079 Areometer:
Areometer for measuring the sugar content of water sugar solutions
Density range 0 ... 300 g/L

L2-06-082 Beaker 250 ml:
Borosilicate beaker 250ml

L2-06-083 Test tubes:
Test tubes 160x60

L2-06-084 Grip stopper:
Grip stopper for test tube L2-06-083

L2-06-085 Pasteuer pipette:
Plastics pasteuer pipette

L2-06-086 Measuring cylinder 100ml:
Measuring cylinder 100 ml (PE)

L2-06-087 Syringe 2ml:

L2-06-110 Silicone ring:

L3-01-013 Lid for tray:

L3-01-078 Padding "BioFuel-Large":

L3-03-016 leXsolar-CD:
The leXsolar-CD covers all student and teacher manuals's as pdf- and word-file. If you need manual's as printed version, you can order them separately.

Specifications extras needed:

1700-02:

9100-03:
The IV-Module is able to measure current and voltage and therefore replaces conventional multimeters completely. With touch buttons three measurement modes can be selected: current, voltage and combined current-/voltage-measurement.
leXsolar AV-Module is intuitive and easy to use but yet allows precice and professional

measurements. A high resolution graphics display shows the measurement values as well as visualizes the measurement modes.

Technical specifications:

Voltage measurement:

- Range: 0...12 V
- Accuracy: 1mV
- Overvoltage protection >12V

Current measurement

- Range: 0...2 A
- Accuracy: 0.1mA (0...199mA) and 1mA (200mA...1A)
- Automatic fuse protection >2A (reactivation with touch button)
- Internal resistance <0.5 Ohm (0...200mA); <0.2 Ohm (200mA...2A)

Electrical connection:

- compatible to leXsolar-basic unit
- 4mm-banana plugs

Display: Graphics display resolution 192x192

Power supply: 2 x AA battery or rechargeable

Interfaces:

- Display to read the measurement values
- leXsolar USB-Connect* for direct PC-connection
- leXsolar Wireless-Connect* for wireless data acquisition

*available 2015

Specifications extras available:

L3-03-096:

Every leXsolar-training kit comes with the leXsolar-CD. There you can find all the students and teacher manuals as pdf and as word file. Of course you can order them as printed version as well.

L3-03-103:

Every leXsolar-training kit comes with the leXsolar-CD. There you can find all the students and teacher manuals as pdf and as word file. Of course you can order them as printed version as well.