

tikz-chemlab

A TikZ port of `pst-labo` for chemical laboratory drawings

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<https://github.com/aihua/tikz-chemlab>

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Abstract

`tikz-chemlab` is a TikZ-based reimplementation of the well-known `pst-labo` package. It provides a collection of high-level macros for drawing chemical laboratory glassware—test tubes, flasks, beakers, burettes, distillation apparatus, separating funnels, and many more—using the TikZ drawing engine instead of PSTricks.

The main differences from `pst-labo` are:

- Command names: `pst` prefix $\rightarrow$ `tkz` prefix; French words $\rightarrow$ English (e.g. `TubeEssais` $\rightarrow$ `TestTube`, `Eprouvette` $\rightarrow$ `GraduatedCylinder`, `Ballon` $\rightarrow$ `RoundFlask`).
- Option keys: French $\rightarrow$ English (e.g. `niveauLiquide1` $\rightarrow$ `liquidLevel1`, `tubePenche` $\rightarrow$ `tiltAngle`, `bouchon` $\rightarrow$ `stopper`).
- `pspicture` environments are replaced by `tikzpicture` environments.
- `\rput` is replaced by `\begin{scope}[shift={{x,y}}]` or `\node at (x,y)`.
- `\psset{unit=Ncm}` is replaced by `tikzpicture[scale=N]` or `\begin{scope}[scale=N]`.
- PSTricks `\psline`, `\psframe`, `\psellipse` are replaced by their TikZ equivalents (`\draw`, `\fill`, `\filldraw`).
- `\newsstyle` is replaced by `\tikzset{...}`.

This document describes all macros, options, predefined colours and styles, and provides ready-to-compile examples.

Thanks to the original `pst-labo` authors for their excellent work, which made this port possible.

Repository: <https://github.com/aihua/tikz-chemlab>

Support: <https://github.com/aihua/tikz-chemlab/issues>

Contents

1	Installation and loading	4
2	Quick start	4
3	Parameters	5
3.1	glassType	6
3.2	stopper	6
3.3	clamp	7
3.4	straightTube	7
3.5	elbowTube	7
3.6	uTube and uTubeLong	7
3.7	label and Number	8
3.8	tiltAngle	8
3.9	tubeOnly	8
3.10	bunsenBurner	8
3.11	bubbling	9
3.12	substance	9
3.13	solid	10
3.14	curvedTube and curvedTubeShort	10
3.15	doubleTube	10
3.16	condenserBulbs	10
3.17	gasCollection	11
3.18	burette	11
3.19	buretteLevel and buretteColor	11
3.20	MixtureStyle and DistillateColor	11
3.21	pHMeter	12
3.22	magneticStirrer	12
3.23	liquidLevel1/2/3 and liquidStyle1/2/3	12
4	Predefined colours and styles	12
5	Line width and styles	13
6	Macros	14
6.1	\tkzTestTube	14
6.2	\tkzHeatTube	14
6.3	\tkzRoundFlask	15
6.4	\tkzHeatFlask	15
6.5	\tkzFunnel	15
6.6	\tkzGraduatedCylinder	15
6.7	\tkzPipette	16
6.8	\tkzTitration	16
6.9	\tkzDistillation	16

6.10	<code>\tkzSeparatoryFunnel</code>	17
6.11	<code>\tkzStand</code>	17
7	Positioning and coordinate mapping	18
7.1	From <code>\rput</code> to TikZ <code>shift</code>	18
7.2	Scale mapping: <code>unit=Ncm</code> to <code>scale=N</code>	18
7.3	<code>xunit</code> / <code>yunit</code> mapping	19
8	Examples	19
8.1	Titration setup with labels	19
8.2	Test tube rack with labels	20
8.3	Separating funnel with beakers	21
9	Migration from <code>pst-labo</code>	22
9.1	Checklist	22
9.2	Command name mapping	22
9.3	Option key mapping	23
9.4	<code>glassType</code> value mapping	24
9.5	Common pitfalls	25
10	Basic objects (internal)	25
11	Version history and credits	27

1 Installation and loading

The package consists of three files which must be placed in the same directory or in the TeX search path:

File	Role
<code>tikz-chemlab.sty</code>	LaTeX package wrapper (loads TikZ + main file)
<code>tikz-chemlab.tex</code>	Main implementation (parameter system + high-level macros)
<code>tikz-chemlabObj.tex</code>	Shape library (low-level drawing primitives)

Load the package in the preamble:

```
\usepackage{tikz-chemlab}
```

This automatically loads `tikz` and the required libraries (`arrows.meta`, `calc`, `patterns`, `shadings`, `decorations.pathmorphing`, `decorations.pathreplacing`).

2 Quick start

A minimal example:

```
\documentclass{standalone}
\usepackage{tikz-chemlab}
\begin{document}
\begin{tikzpicture}[scale=0.5]
  \tkzTestTube
\end{tikzpicture}
\end{document}
```

This draws a standard test tube at 50% scale. The correspondence between `pst-labo` and `tikz-chemlab` is:

<code>pst-labo</code>	<code>tikz-chemlab</code>
<code>\psset{unit=0.5cm}</code>	<code>tikzpicture[scale=0.5]</code>
<code>\psset{glassType=ballon}</code>	pass as option: <code>[glassType=roundFlask]</code>
<code>\rput(x,y){obj}</code>	<code>\begin{scope}[shift={(x,y)}]</code> <code>... \end{scope}</code>
<code>\psline{->}(a,b)(c,d)</code>	<code>\draw[-{Stealth}] (a,b) -</code> <code>(c,d);</code>
<code>\psgrid</code>	<code>[help lines]</code> or <code>\draw[help</code> <code>lines] (0,0) grid (N,N);</code>

3 Parameters

Table 1 lists all parameters recognised by `tikz-chemlab`. They are set either via `\chemlabset{...}` (global, equivalent to `\psset[pst-labo]{...}`) or as optional arguments to individual macros.

Table 1: All parameters of `tikz-chemlab`

Parameter	Default	Description
<code>glassType</code>	<code>tube</code>	Type of glass container: <code>tube</code> , <code>roundFlask</code> , <code>beaker</code> , <code>erlenmeyer</code> , <code>reagentBottle</code> , <code>volumetricFlask</code> , <code>watchGlass</code>
<code>stopper</code>	<code>false</code>	Inserts a stopper
<code>clamp</code>	<code>false</code>	Attaches a wooden test-tube clamp
<code>straightTube</code>	<code>false</code>	Inserts a straight narrow glass tube
<code>elbowTube</code>	<code>false</code>	Inserts a right-angled glass tube
<code>uTube</code>	<code>false</code>	Inserts a U-shaped glass tube
<code>uTubeLong</code>	<code>false</code>	U-shaped tube extending to bottom
<code>curvedTube</code>	<code>false</code>	Creates a gas-collection device with burner
<code>curvedTubeShort</code>	<code>false</code>	Gas-collection device without burner
<code>doubleTube</code>	<code>false</code>	Two narrow tubes, one with stopcock
<code>condenserBulbs</code>	<code>false</code>	Ball condenser (reflux setup)
<code>label</code>	<code>false</code>	Displays the label defined by <code>Number</code>
<code>Number</code>	<code>(empty)</code>	Label text (used with <code>label</code>)
<code>tiltAngle</code>	<code>0</code>	Tilt angle in degrees ($-65 \dots +65$)
<code>liquidLevel1</code>	<code>50</code>	Liquid level 1 (0–100, percentage)
<code>liquidLevel2</code>	<code>0</code>	Liquid level 2
<code>liquidLevel3</code>	<code>0</code>	Liquid level 3
<code>liquidStyle1</code>	<code>liquidStyle1</code>	Style for liquid 1
<code>liquidStyle2</code>	<code>liquidStyle2</code>	Style for liquid 2
<code>liquidStyle3</code>	<code>liquidStyle3</code>	Style for liquid 3
<code>substance</code>	<code>(empty)</code>	Substance macro (e.g. <code>\tkzChampagneBubbles</code>)
<code>solid</code>	<code>(empty)</code>	Solid substance macro
<code>burette</code>	<code>true</code>	Show/hide burette (in <code>\tkzTitration</code>)
<code>pHMeter</code>	<code>false</code>	Show pH-meter
<code>magneticStirrer</code>	<code>true</code>	Show magnetic stirrer / hotplate
<code>bunsenBurner</code>	<code>true</code>	Show Bunsen burner
<code>bubbling</code>	<code>false</code>	Adds bubbling test tube
<code>gasCollection</code>	<code>false</code>	Adds gas-collection vessel
<code>tubeOnly</code>	<code>false</code>	Suppresses extra container space
<code>buretteLevel</code>	<code>20</code>	Burette liquid level
<code>buretteColor</code>	<code>VeryPaleOrange</code>	Burette liquid colour
<code>reagentLevel</code>	<code>2</code>	Reagent level (pipette)

Table 1 (continued)

Parameter	Default	Description
reagentColor	PaleOrange	Reagent colour
MixtureStyle	BlueDiffusion	Distillation mixture style
DistillateColor	yellow	Distillate colour
TapOpen	false	Separating funnel tap open/closed
buretteReagent	(empty)	Burette reagent label text
beakerReagent	(empty)	Beaker reagent label text

3.1 glassType

glassType selects the type of glass container. A normal test tube is used by default.

```

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube
\end{tikzpicture}

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[glassType=roundFlask]
\end{tikzpicture}

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[glassType=erlenmeyer]
\end{tikzpicture}

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[glassType=beaker]
\end{tikzpicture}

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[glassType=reagentBottle]
\end{tikzpicture}

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[glassType=volumetricFlask]
\end{tikzpicture}

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[glassType=watchGlass]
\end{tikzpicture}

```

3.2 stopper

The option stopper seals the glass container with a stopper.

```

\begin{tikzpicture}[scale=0.45]
  \tkzTestTube[glassType=tube,stopper=true]

  \begin{scope}[xshift=3cm]

```

```

\tkzTestTube[glassType=roundFlask,stopper=true]
\end{scope}

\begin{scope}[xshift=6cm]
\tkzTestTube[glassType=erlenmeyer,stopper=true]
\end{scope}

\begin{scope}[xshift=9cm]
\tkzTestTube[glassType=reagentBottle,stopper=true]
\end{scope}

\begin{scope}[xshift=12cm]
\tkzTestTube[glassType=watchGlass,stopper=true]
\end{scope}
\end{tikzpicture}

```

3.3 clamp

The option `clamp` attaches a wooden test-tube clamp.

```

\begin{tikzpicture}[scale=0.5]
\tkzTestTube[glassType=tube,stopper=true,clamp=true]
\tkzTestTube[glassType=erlenmeyer,stopper=true,clamp=true]
\end{tikzpicture}

```

3.4 straightTube

`straightTube` inserts a narrow straight glass tube. It is normally combined with `stopper=true`.

```

\begin{tikzpicture}[scale=0.5]
\tkzTestTube[straightTube=true]
\tkzTestTube[glassType=roundFlask,straightTube=true]
\tkzTestTube[glassType=erlenmeyer,straightTube=true]
\end{tikzpicture}

```

3.5 elbowTube

`elbowTube` is identical to `straightTube` but draws a right-angled glass tube.

```

\begin{tikzpicture}[scale=0.5]
\tkzTestTube[glassType=erlenmeyer,elbowTube=true]
\end{tikzpicture}

```

3.6 uTube and uTubeLong

`uTube` draws a U-shaped glass tube. `uTubeLong` extends the U-tube to the bottom (used in `\tkzHeatFlask`).

```

\begin{tikzpicture}[scale=0.5]
  \tkzHeatFlask[glassType=roundFlask,uTube=true]
  \tkzHeatFlask[glassType=roundFlask,uTubeLong=true]
\end{tikzpicture}

```

3.7 label and Number

label toggles display of labels defined by Number.

Important: In tikz-chemlab, \tkzTestTube resets parameters to defaults on each call. Therefore label must be passed explicitly to each invocation, even if \chemlabset{label} was used globally.

```

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[label=true,Number=1]
  \tkzTestTube[label=true,Number=2]
  \tkzTestTube[glassType=reagentBottle,stopper=true,%
               label=true,Number={\small Cu$^{2+}$}]
\end{tikzpicture}

```

3.8 tiltAngle

tiltAngle tilts the device to any angle in the range $-65 \dots +65$ degrees while keeping the liquid surface horizontal.

```

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[straightTube=true,tiltAngle=40]
  \tkzTestTube[tiltAngle=-20,stopper=true]
\end{tikzpicture}

```

3.9 tubeOnly

tubeOnly influences the bounding box of \tkzHeatTube. When set, no extra space is reserved for an additional container on the right.

```

\begin{tikzpicture}[scale=0.5]
  \tkzHeatTube[bunsenBurner=true,bubbling=true,glassType=roundFlask]
\end{tikzpicture}
\begin{tikzpicture}[scale=0.5]
  \tkzHeatTube[tubeOnly=true,glassType=roundFlask]
\end{tikzpicture}

```

3.10 bunsenBurner

bunsenBurner toggles the Bunsen burner. It defaults to true for \tkzHeatTube and false for \tkzHeatFlask.

```

\begin{tikzpicture}[scale=0.5]
  \tkzHeatTube[tubeOnly=true]
  \tkzHeatTube[tubeOnly=true,bunsenBurner=false]
\end{tikzpicture}

```

3.11 bubbling

`bubbling` creates an additional test tube connected via a narrow glass tube.

```

\begin{tikzpicture}[scale=0.5]
  \tkzHeatTube[tubeOnly=true]
  \tkzHeatTube[bubbling=true]
\end{tikzpicture}

```

3.12 substance

`substance` selects the type of substance inside the container. Table 2 lists the available macros.

Table 2: Macros for the option `substance`

Macro	Default	Comment
<code>\tkzChampagneBubbles[N]</code>	25	Champagne bubbles
<code>\tkzFilaments[N]{color}</code>	5	Filaments
<code>\tkzBalls[N]</code>	50	2D balls
<code>\tkzBubblesThreeD[N]{color}</code>	50	3D balls

```

\begin{tikzpicture}[scale=0.5]
  \tkzTestTube
  \tkzTestTube[substance=\tkzChampagneBubbles]
  \tkzTestTube[substance=\tkzFilaments{red}]
  \tkzTestTube[substance=\tkzBalls]
  \tkzTestTube[substance=\tkzBubblesThreeD{white}]
\end{tikzpicture}

```

When using optional parameters for the internal loop count, enclose the macro call in curly braces:

```

\tkzTestTube[substance={\tkzChampagneBubbles[80]}]
\tkzTestTube[substance={\tkzFilaments[20]{black}}]
\tkzTestTube[substance={\tkzBalls[80]}]
\tkzTestTube[substance={\tkzBubblesThreeD[20]{white}}]

```

3.13 solid

`solid` describes solid substances. Table 3 lists the available macros.

Table 3: Macros for the option `solid`

Macro	Default
<code>\tkzCopperTurnings[N]</code>	30
<code>\tkzIronNail[N]</code>	60
<code>\tkzZincGranules[N]</code>	25

```
\begin{tikzpicture}[scale=0.5]
  \tkzTestTube[solid=\tkzCopperTurnings]
  \tkzTestTube[solid=\tkzIronNail]
  \tkzTestTube[solid=\tkzZincGranules]
\end{tikzpicture}
```

3.14 curvedTube and curvedTubeShort

`curvedTube` creates a device to collect exhaust gas from the glass container, including a Bunsen burner. `curvedTubeShort` does the same without a burner.

```
\begin{tikzpicture}[scale=0.5]
  \tkzHeatFlask[glassType=erlenmeyer,
    gasCollection=true, substance=\tkzCopperTurnings]
  \tkzHeatFlask[glassType=erlenmeyer,
    gasCollection=true, substance=\tkzCopperTurnings,
    curvedTube=true]
\end{tikzpicture}
```

3.15 doubleTube

`doubleTube` arranges two narrow glass tubes, one with a stopcock.

```
\begin{tikzpicture}[scale=0.5]
  \tkzRoundFlask
  \tkzRoundFlask[doubleTube=true]
\end{tikzpicture}
```

3.16 condenserBulbs

`condenserBulbs` outputs a reflux setup with a ball condenser.

```
\begin{tikzpicture}[scale=0.5]
```

```

\tkzRoundFlask[condenserBulbs=true,glassType=roundFlask,substance=\
  ↪ tkzIronNail]
\end{tikzpicture}

```

3.17 gasCollection

gasCollection adds a device for collecting expanded gases.

```

\begin{tikzpicture}[scale=0.5]
\tkzHeatFlask[glassType=reagentBottle,curvedTube=true,
  substance={\tkzFilaments[10]{red}}]
\tkzHeatFlask[glassType=reagentBottle,curvedTube=true,
  substance={\tkzFilaments[10]{red}},
  gasCollection=true]
\end{tikzpicture}

```

3.18 burette

\tkzTitration displays a burette by default. burette=false suppresses it.

```

\begin{tikzpicture}[scale=0.4]
\tkzTitration[glassType=erlenmeyer]
\tkzTitration[glassType=erlenmeyer,burette=false]
\end{tikzpicture}

```

3.19 buretteLevel and buretteColor

These control the amount and colour of the fluid in the burette.

```

\begin{tikzpicture}[scale=0.4]
\tkzTitration[buretteLevel=25,buretteColor=cyan]
\tkzTitration[buretteLevel=10]
\end{tikzpicture}

```

3.20 MixtureStyle and DistillateColor

MixtureStyle defines the colour of the chemical mixture in the distillation flask (must be a gradient style). DistillateColor defines the distillate colour without restriction.

```

\begin{tikzpicture}[scale=0.4]
\tkzDistillation
\tkzDistillation[MixtureStyle=Diffusion,DistillateColor=red]
\end{tikzpicture}

```

3.21 pHMeter

pHMeter displays a pH-meter (only with \tkzTitration).

```
\begin{tikzpicture}[scale=0.5]
  \tkzTitration
  \tkzTitration[pHMeter=true]
\end{tikzpicture}
```

3.22 magneticStirrer

magneticStirrer is active by default and displays a hotplate with a magnetic stirrer. When deactivated, only a plain rectangle is drawn.

```
\begin{tikzpicture}[scale=0.5]
  \tkzTitration
  \tkzTitration[magneticStirrer=false]
\end{tikzpicture}
```

3.23 liquidLevel1/2/3 and liquidStyle1/2/3

These define fluid level (0–100) and style for up to three liquid layers, where liquidLevel1 > liquidLevel2 > liquidLevel3.

```
\begin{tikzpicture}[scale=0.4]
  \tkzTitration[buretteLevel=18,liquidLevel1=30,%
    liquidStyle1=Champagne,pHMeter=true]
  \tkzTitration[buretteLevel=20,liquidLevel1=40,%
    liquidStyle1=Champagne,pHMeter=false,%
    magneticStirrer=false]
\end{tikzpicture}
```

4 Predefined colours and styles

The following colours and styles are predefined in tikz-chemlab. All can be redefined by the user.

Colours

```
\definecolor{Beige}          {rgb}{0.96,0.96,0.86}
\definecolor{LightGray}      {gray}{0.80}
\definecolor{VeryLightGray}  {cmyk}{0,0,0,0.1}
\definecolor{VeryPaleOrange} {cmyk}{0,0.1,0.3,0}
\definecolor{PaleOrange}     {rgb}{1.00,0.78,0.55}
\definecolor{LightBlue1}     {rgb}{0.60,0.80,1.00}
\definecolor{LightBlue}      {rgb}{0.68,0.85,0.90}
\definecolor{Copper}         {cmyk}{0,0.9,0.9,0.2}
```

```

\definecolor{Brown}{rgb}{0.50,0.25,0.00}
\definecolor{woodColor}{rgb}{0.957,0.84,0.69}
\definecolor{AqueousPhaseColor}{cmk}{0.215686,0.062745,0,0}
\definecolor{OrganicPhaseColor}{cmk}{0.223529,0.094118,0.501961,0}

```

Liquid styles (TikZ \tikzset)

```

\tikzset{
  liquidStyle1/.style={fill=cyan,draw=none},
  liquidStyle2/.style={fill=yellow,draw=none},
  liquidStyle3/.style={fill=magenta,draw=none},
  Ball3D/.style={shading=ball,ball color=cyan,draw=none},
  Champagne/.style={fill=Beige,draw=none},
  Blood/.style={fill=red,draw=none},
  Cobalt/.style={fill=blue,line width=0.2cm},
  Oil/.style={fill=yellow,draw=none},
  Vinegar/.style={fill=magenta,draw=none},
  Diffusion/.style={bottom color={rgb,255:red,0;green,25;blue,242},
    top color=cyan,draw=none},
  MixtureDiffusion2/.style={bottom color=white,top color=red,draw=red},
  flameAndGrill/.style={bottom color=PaleOrange,top color=yellow,draw=
    ↪ none},
  YellowStripes/.style={pattern=north east lines,pattern color=yellow},
  BlueDiffusion/.style={bottom color=green,top color=cyan,draw=none},
  AqueousPhase/.style={fill=AqueousPhaseColor,draw=none},
  OrganicPhase/.style={fill=OrganicPhaseColor,draw=none},
}

```

Defining a custom style

Use `\tikzset` to define a new liquid style:

```

\tikzset{Nickel/.style={fill=green,draw=none}}
\tkzTestTube[liquidStyle1=Nickel]

```

5 Line width and styles

`tikz-chemlab` provides a sophisticated line-width system that automatically scales with the current TikZ `scale`. Six presets are available via `\chemlabset{style=...}`:

```

\chemlabset{style=publication}
\begin{tikzpicture}[scale=0.5]
  \tkzTestTube
\end{tikzpicture}

```

Individual line widths can also be set:

Table 4: Predefined line-width styles

Style	Outline	Ellipse	Tube ellipse	Graduation
default	0.053 cm	0.07 cm	0.08 cm	0.02 cm
publication	0.4 pt	0.6 pt	0.8 pt	0.4 pt
presentation	0.8 pt	1.2 pt	1.6 pt	0.6 pt
schematic	0.6 pt	0.8 pt	1.2 pt	0.4 pt
draft	0.4 pt	0.4 pt	0.4 pt	0.4 pt
bold	1.2 pt	1.6 pt	1.6 pt	0.8 pt

```
\chemlabset{outline line width=0.04cm}
\chemlabset{graduation line width=thick}
\chemlabset{line width=0.5pt} % sets all four at once
```

Valid values for named widths: `thin` (0.4 pt), `semithick` (0.6 pt), `thick` (0.8 pt), `very thick` (1.2 pt), `ultra thick` (1.6 pt), or any numeric value (e.g. 0.04cm, 1pt).

6 Macros

6.1 `\tkzTestTube`

Displays the simplest glass container. Default is a test tube (`glassType=tube`).

```
\begin{tikzpicture}[scale=0.5]
  \tkzTestTube
  \tkzTestTube[glassType=beaker]
  \tkzTestTube[glassType=erlenmeyer,liquidLevel1=80]
  \tkzTestTube[glassType=reagentBottle]
  \tkzTestTube[glassType=roundFlask,liquidLevel1=20,liquidStyle1=
    ↪ BlueDiffusion]
  \tkzTestTube[glassType=volumetricFlask]
  \tkzTestTube[glassType=watchGlass]
\end{tikzpicture}
```

6.2 `\tkzHeatTube`

Enhances `\tkzTestTube` with a heat block, Bunsen burner, or second narrow glass tube.

```
\begin{tikzpicture}[scale=0.5]
  \tkzHeatTube[tubeOnly=true]
  \tkzHeatTube[glassType=roundFlask,bunsenBurner=false,tubeOnly=true]
  \tkzHeatTube[glassType=erlenmeyer,bunsenBurner=true,clamp=true,
    ↪ tubeOnly=true]
```

```

\tkzHeatTube[bunsenBurner=true,bubbling=true,glassType=reagentBottle]
\tkzHeatTube[bunsenBurner=true,elbowTube=true,glassType=roundFlask,%
              liquidLevel1=20,liquidStyle1=BlueDiffusion,%
              tubeOnly=true,clamp=true]
\end{tikzpicture}

```

6.3 \tkzRoundFlask

Identical to \tkzTestTube with additional options (reflux condenser, double tube, etc.).

```

\begin{tikzpicture}[scale=0.5]
\tkzRoundFlask
\tkzRoundFlask[glassType=erlenmeyer]
\tkzRoundFlask[condenserBulbs=true]
\end{tikzpicture}

```

6.4 \tkzHeatFlask

Enhances \tkzRoundFlask by displaying a Bunsen burner by default.

```

\begin{tikzpicture}[scale=0.5]
\tkzHeatFlask
\tkzHeatFlask[bubbling=true,uTubeLong=true,bunsenBurner=true,%
              substance=\tkzBalls]
\tkzHeatFlask[glassType=reagentBottle,gasCollection=true,%
              curvedTubeShort=true,%
              substance={\tkzFilaments[10]{red}}]
\tkzHeatFlask[doubleTube=true,gasCollection=true,%
              substance=\tkzIronNail]
\end{tikzpicture}

```

6.5 \tkzFunnel

Displays a funnel. Called without parameters it is combined with a test tube.

```

\begin{tikzpicture}[scale=0.5]
\tkzFunnel
\tkzFunnel[glassType=beaker,tiltAngle=-20]
\tkzFunnel[glassType=reagentBottle,label=true,Number={37},%
              liquidStyle1=BlueDiffusion,liquidLevel1=80]
\end{tikzpicture}

```

6.6 \tkzGraduatedCylinder

Displays a measuring cylinder. Its size can be changed with the TikZ scale factor.

```

\begin{tikzpicture}[scale=0.5]
  \tkzGraduatedCylinder
  \tkzGraduatedCylinder[liquidLevel1=100,liquidLevel2=60,liquidLevel3
    ↗ =30]
\end{tikzpicture}

```

```

% yunit=0.5cm -> yscale=0.5 (only y, x stays 1)
\begin{tikzpicture}
  \begin{scope}[yscale=0.5]\tkzGraduatedCylinder\end{scope}
\end{tikzpicture}

```

6.7 \tkzPipette

Displays a pipette. Its scaling can be altered with TikZ scale factors.

```

% unit=0.5cm -> scale=0.5
\begin{tikzpicture}[scale=0.5]
  \tkzPipette
\end{tikzpicture}

% yunit=0.5cm -> yscale=0.5 (only y, x stays 1)
\begin{tikzpicture}[yscale=0.5]
  \tkzPipette
\end{tikzpicture}

```

Note: The option `tiltAngle` has no effect on `\tkzPipette`, matching the original `pst-labo` behaviour.

6.8 \tkzTitration

Displays a titration setup with a burette (max. 25 mL). An optional pH-meter or hotplate can be selected. Multiple `\tkzTitration` calls in the same `tikzpicture` are automatically placed side by side.

```

\begin{tikzpicture}[scale=0.5]
  \tkzTitration
  \tkzTitration[glassType=beaker,pHMeter=true]
  \tkzTitration[buretteLevel=10,liquidLevel1=60,%
    liquidStyle1=Champagne,glassType=reagentBottle,%
    magneticStirrer=false]
  \tkzTitration[glassType=erlenmeyer,burette=false]
\end{tikzpicture}

```

6.9 \tkzDistillation

Displays a fractional distillation apparatus.

```

\begin{tikzpicture}[scale=0.5]

```

```

\tkzDistillation
\tkzDistillation[MixtureStyle=Diffusion,DistillateColor=red]
\end{tikzpicture}

```

6.10 \tkzSeparatoryFunnel

Displays a separating funnel (separatory funnel) on a support stand. Options: `TapOpen` (tap open/closed), `stopper` (stopper), `liquidLevel1` (aqueous phase level), `liquidLevel2` (organic phase level).

```

\begin{tikzpicture}[scale=0.5]
  \useasboundingbox (-2,-6) rectangle (6,16);
  \tkzStand
  \tkzSeparatoryFunnel[TapOpen=false,stopper=true]
\end{tikzpicture}
\quad
\begin{tikzpicture}[scale=0.5]
  \useasboundingbox (-2,-6) rectangle (6,16);
  \tkzStand
  \tkzSeparatoryFunnel[TapOpen=false,stopper=false,%
    liquidLevel1=-1,liquidLevel2=10]
  % beaker below
  \begin{scope}[shift={(-0.25,-4.4)}]
    \tkzTestTube[glassType=beaker,liquidStyle1=AqueousPhase]
  \end{scope}
\end{tikzpicture}
\quad
\begin{tikzpicture}[scale=0.5]
  \useasboundingbox (-2,-6) rectangle (6,16);
  \tkzSeparatoryFunnel[TapOpen=true,stopper=false,%
    liquidLevel1=1,liquidLevel2=1]
  \begin{scope}[shift={(-0.25,-4.4)}]
    \tkzTestTube[glassType=beaker,liquidStyle1=OrganicPhase,%
      liquidLevel1=30]
  \end{scope}
  \tkzStand
\end{tikzpicture}

```

6.11 \tkzStand

Displays a support stand (retort stand) with clamp. Used together with `\tkzSeparatoryFunnel`.

```

\begin{tikzpicture}[scale=0.5]
  \tkzStand
\end{tikzpicture}

```

7 Positioning and coordinate mapping

7.1 From `\rput` to TikZ `shift`

In PSTricks, `\rput(x,y){obj}` places the **bbbox centre** of `obj` at `(x,y)` (default `ref=c`). In TikZ, `\begin{scope}[shift={(x,y)}]` places the **local origin** `(0,0)` at `(x,y)`.

The conversion formula is:

$$\text{shift} = \text{rput_position} - \text{bbbox_centre}$$

Example: `\tkzGraduatedCylinder`

`\tkzGraduatedCylinder` bbbox: `(-2,0)(2,6)`, centre `(0,3)`. For `\rput(-4.5,4.0)`:

```
% pst-labo: \rput(-4.5,4.0){\pstEprouvette[...]}
% shift = (-4.5 - 0, 4.0 - 3) = (-4.5, 1.0)
\begin{scope}[shift={(-4.5,1.0)}]
  \tkzGraduatedCylinder[...]
\end{scope}
```

Example: `\tkzTestTube` (beaker)

`\tkzTestTube` bbbox (beaker, `tiltAngle=0`): `(-0.5,0)(1,2.8)`, centre `(0.25,1.4)`. For `\rput(0,-3)`:

```
% pst-labo: \rput(0,-3){\pstTubeEssais[glassType=becher,...]}
% shift = (0 - 0.25, -3 - 1.4) = (-0.25, -4.4)
\begin{scope}[shift={(-0.25,-4.4)}]
  \tkzTestTube[glassType=beaker,...]
\end{scope}
```

Bbox centre table

7.2 Scale mapping: `unit=Ncm` to `scale=N`

PSTricks `\psset{unit=N}` sets the unit to N cm. In TikZ, `scale=N` scales all coordinates by N .

When `scale=N` is applied to a scope containing a macro, the macro's internal coordinates are multiplied by N . The `\shift` value is in the **parent** (unscaled) coordinate system.

```
% pst-labo: \rput(3,0){\pstDosage[... ,unit=0.5]}
% tkzTitration bbbox centre (pHMeter) = (-1,8)
% scale=0.5, physical centre = (0.5*(-1), 0.5*8) = (-0.5, 4)
% shift = (3 - (-0.5), 0 - 4) = (3.5, -4)
\begin{scope}[shift={(3.5,-4)},scale=0.5]
```

Table 5: Bounding-box centres for `\rput` alignment

Condition	Bbox	Centre
<code>\tkzTestTube</code> (tiltAngle=0):		
glassType=beaker	(-0.5,0)(1,2.8)	(0.25, 1.4)
other (tube, round- Flask, ...)	(-1.5,0)(1.5,4)	(0, 2)
<code>\tkzTestTube</code> (tiltAngle≠0):		
tiltAngle>0	(-3,0)(1,4)	(-1, 2)
tiltAngle<0	(-1,0)(3,4)	(1, 2)
elbowTube=true	(-1,0)(6,4)	(2.5, 2)
<code>\tkzGraduatedCylinder</code>	(-2,0)(2,6)	(0, 3)
<code>\tkzFunnel</code>	(-2,-2)(2,5)	(0, 1.5)
<code>\tkzTitration</code> (burette, pHMeter)	(-5,0)(3,16)	(-1, 8)
<code>\tkzTitration</code> (burette, no pHMeter)	(-2,0)(2,16)	(0, 8)
<code>\tkzTitration</code> (no bu- rette, pHMeter)	(-5,0)(3,5)	(-1, 2.5)
<code>\tkzTitration</code> (no bu- rette, no pHMeter)	(-2,0)(2,5)	(0, 2.5)

```
\tkzTitration[... ,pHMeter=true]
\end{scope}
```

7.3 xunit / yunit mapping

PSTricks xunit and yunit scale only one axis:

PSTricks	TikZ
unit=N	scale=N
xunit=N	xscale=N
yunit=N	yscale=N

8 Examples

8.1 Titration setup with labels

```
\begin{tikzpicture}
  \useasboundingbox (0,-4) rectangle (7,4);
  % \rput(3,0){\pstDosage[... ,unit=0.5]}
  \begin{scope}[shift={(3.5,-4)},scale=0.5]
    \tkzTitration[buretteLevel=25,liquidLevel1=30,%
      liquidStyle1=Champagne,glassType=beaker,pHMeter=true]
```

```

\end{scope}

\node at (2,3) {B\`urette};
\node at (4.7,3.6) {25 mL};
\node at (5.2,-2.2) {H$_3$O$^+ + Cl$^-};
\node at (.8,-3) {PH-Messer};
\node at (5,-2.8) {20 mL};
\node at (5,1) {Na$^+ + OH$^-};
\node at (6.4,-3.6) {Heizplatte};
\draw[-{Stealth}] (2.7,2.9) -- (3.4,2.9);
\end{tikzpicture}
\begin{tikzpicture}
\useasboundingbox (-3,-2) rectangle (2,3);
\begin{scope}[scale=0.5]
\begin{scope}[shift={(-4.25,1.5)}]
\tkzGraduatedCylinder[tiltAngle=-60,liquidLevel1=90,liquidLevel2
↪ =50]
\end{scope}
\begin{scope}[shift={(0.25,-0.75)}]
\tkzFunnel[glassType=reagentBottle,liquidLevel1=30]
\end{scope}
\end{scope}
\node[draw] at (0.25,3.75) {%
\begin{minipage}{3.2cm}Nach der Dekantation
sind die einzelnen Phasen getrennt.
\end{minipage}};
\end{tikzpicture}

```

8.2 Test tube rack with labels

```

\begin{tikzpicture}[scale=0.5,
Nickel/.style={fill=green,draw=none}]
\tkzTestTube[liquidLevel1=20,liquidStyle1=Champagne,%
Number=1,label=true]
\begin{scope}
\tkzTestTube[liquidLevel1=30,liquidStyle1=Cobalt,%
Number=2,label=true]
\end{scope}
\begin{scope}[xshift=2cm]
\tkzTestTube[liquidLevel1=40,liquidStyle1=Blood,%
Number=3,label=true]
\end{scope}
\begin{scope}[xshift=4cm]
\tkzTestTube[Number=4,label=true]
\end{scope}
\begin{scope}[xshift=6cm]
\tkzTestTube[liquidStyle1=Vinegar,%
Number={\footnotesize MnO$_4^-$},%
label=true,stopper=true,glassType=reagentBottle]
\end{scope}
\begin{scope}[xshift=8.2cm]
\tkzTestTube[liquidStyle1=Oil,%

```

```

        Number={\footnotesize Ce$^{4+}$},%
        label=true,stopper=true,glassType=reagentBottle]
\end{scope}
\begin{scope}[xshift=10.5cm]
    \tkzTestTube[liquidStyle1=Nickel,%
        Number={\footnotesize Ni$^{2+}$},%
        label=true,stopper=true,glassType=reagentBottle]
\end{scope}
\begin{scope}[xshift=13cm]
    \tkzTestTube[Number={\footnotesize Cu$^{2+}$},%
        label=true,stopper=true,glassType=reagentBottle]
\end{scope}
\begin{scope}[xshift=15.5cm]
    \tkzTestTube[liquidLevel1=30,liquidStyle1=Champagne,%
        Number={\footnotesize NaOH},%
        label=true,stopper=true,glassType=reagentBottle]
\end{scope}
\end{tikzpicture}

```

8.3 Separating funnel with beakers

```

\begin{tikzpicture}[scale=0.5]
    \useasboundingbox (-2,-6) rectangle (6,16);
    \tkzStand
    \tkzSeparatoryFunnel[TapOpen=false,stopper=true]
\end{tikzpicture}
\quad
\begin{tikzpicture}[scale=0.5]
    \useasboundingbox (-2,-6) rectangle (6,16);
    \tkzStand
    \tkzSeparatoryFunnel[TapOpen=false,stopper=false,%
        liquidLevel1=-1,liquidLevel2=10]
    \begin{scope}[shift={(-0.25,-4.4)}]
        \tkzTestTube[glassType=beaker,liquidStyle1=AqueousPhase]
    \end{scope}
\end{tikzpicture}
\quad
\begin{tikzpicture}[scale=0.5]
    \useasboundingbox (-2,-6) rectangle (6,16);
    \tkzSeparatoryFunnel[TapOpen=true,stopper=false,%
        liquidLevel1=1,liquidLevel2=1]
    \begin{scope}[shift={(-0.25,-4.4)}]
        \tkzTestTube[glassType=beaker,liquidStyle1=OrganicPhase,%
            liquidLevel1=30]
    \end{scope}
    \tkzStand
\end{tikzpicture}

```

9 Migration from pst-labo

9.1 Checklist

1. Replace `\usepackage{pst-labo}` with `\usepackage{tikz-chemlab}`.
2. Rename all commands: `pst` prefix $\rightarrow$ `tkz` prefix; French words $\rightarrow$ English. See Table 9.2 for the full mapping.
3. Rename all option keys: French $\rightarrow$ English. See Table 9.3.
4. Rename `glassType` values: French $\rightarrow$ English (e.g. `ballon` $\rightarrow$ `roundFlask`, `becher` $\rightarrow$ `beaker`).
5. Replace `pspicture` with `tikzpicture`.
6. Replace `\psset{unit=Ncm}` with `tikzpicture[scale=N]` or `\begin{scope}[scale=N]`.
7. Replace `\rput(x,y){obj}` with `\begin{scope}[shift={(x,y)}] ... \end{scope}` (remember to subtract the `bbox` centre).
8. Replace `\psline`, `\psframe`, `\psellipse` with `\draw`, `\fill`, `\filldraw`.
9. Replace `\newpsstyle{name}{...}` with `\tikzset{name/.style=...}`.
10. Replace `\psgrid` with `\draw[help lines] (0,0) grid (N,N)`; or the `help lines` option.
11. Pass `label=true` explicitly to each `\tkzTestTube` call (the global `\chemlabset` setting is reset by `\tikzchemlabdefaults`).

9.2 Command name mapping

Table 9.2 shows the full mapping from `pst-labo` command names to `tikz-chemlab` names.

Table 9.2: Command name mapping (`pst-labo` $\rightarrow$ `tikz-chemlab`)

pst-labo	tikz-chemlab
\pstTubeEssais	\tkzTestTube
\pstChauffageTube	\tkzHeatTube
\pstChauffageBallon	\tkzHeatFlask
\pstDosage	\tkzTitration
\pstEprouvette	\tkzGraduatedCylinder
\pstpipette	\tkzPipette
\pstBigPipette	\tkzLargePipette
\pstBallon	\tkzRoundFlask
\pstEntonnoir	\tkzFunnel
\pstSeparateFunnel	\tkzSeparatoryFunnel
\pstDistillation	\tkzDistillation
\pstSupport	\tkzStand
\pscolon	\tkzColumn
\pstBullesChampagne	\tkzChampagneBubbles
\pstBULLES	\tkzBubblesThreeD
\pstbulles	\tkzBubbles
\pstFilaments	\tkzFilaments
\pstBilles	\tkzBalls
\pstClouFer	\tkzIronNail
\pstTournureCuivre	\tkzCopperTurnings
\pstGrenailleZinc	\tkzZincGranules
\pstBecBunsen	\tkzBunsenBurner
\pstFlammeGrille	\tkzFlameGrill
\pstThermo	\tkzThermometer

9.3 Option key mapping

Table 9.3 shows the mapping from pst-labo option keys to tikz-chemlab keys.

Table 9.3: Option key mapping (pst-labo $\rightarrow$ tikz-chemlab)

pst-labo	tikz-chemlab
tubePenche	tiltAngle
niveauLiquide1/2/3	liquidLevel1/2/3
aspectLiquide1/2/3	liquidStyle1/2/3
niveauReactif	reagentLevel
couleurReactif	reagentColor
niveauReactifBurette	buretteLevel
couleurReactifBurette	buretteColor
reactifBurette	buretteReagent
reactifBecher	beakerReagent
CouleurDistillat	DistillateColor
AspectMelange	MixtureStyle
bouchon	stopper
pince	clamp
tubeDroit	straightTube
tubeCoude	elbowTube
tubeCoudeU	uTube
tubeCoudeUB	uTubeLong
tubeRecourbe	curvedTube
tubeRecourbeCourt	curvedTubeShort
doubletube	doubleTube
refrigerantBouilles	condenserBulbs
becBunsen	bunsenBurner
barbotage	bubbling
recuperationGaz	gasCollection
tubeSeul	tubeOnly
tubeDegagementDroit	gasTubeStraight
etiquette	label
Numero	Number
phmetre	pHMeter
agitateurMagnetique	magneticStirrer
OpenTap	TapOpen
solide	solid

9.4 glassType value mapping

The glassType values have also been translated:

pst-labo	tikz-chemlab
tube (unchanged)	tube
ballon	roundFlask
becher	beaker
erlen	erlenmeyer
flacon	reagentBottle
fiolleJauge	volumetricFlask
verre	watchGlass

9.5 Common pitfalls

\useasboundingbox In tikz-chemlab, top-level macros like `\tkzTitration` use `\useasboundingbox` internally. If you place them inside a `tikzpicture` that also has `\useasboundingbox`, the inner one does **not** override the outer one (scope-local). However, for nested macros like `\tkzGraduatedCylinder` inside a figure, `\useasboundingbox` was intentionally removed to avoid conflicts.

label The global `\chemlabset{label}` does **not** persist into `\tkzTestTube` because `\tikzchemlabdefaults` resets it. Always pass `label=true` as a macro option.

tiltAngle on \tkzPipette The original `pst-labo \tkzPipette` does not read `tiltAngle`. This behaviour is faithfully preserved.

unit vs scale `PSTricks unit=N` scales everything including line widths. `TikZ scale=N` does not scale line widths by default, but `tikz-chemlab` intercepts `\chemlabUpdateLineWidths` to scale them automatically.

10 Basic objects (internal)

The file `tikz-chemlabObj.tex` contains all low-level shape primitives. These are normally not called directly by the user, but can be used for custom extensions. Table 6 gives an overview.

Table 6: Low-level objects in `tikz-chemlabObj.tex`

Macro	Description
<code>\tkzBuretteBody</code>	Burette body
<code>\tkzBuretteStopcock</code>	Burette stopcock
<code>\tkzBuretteGraduation</code>	Burette graduation marks
<code>\tkzTitrationPHMeter</code>	pH-meter box
<code>\tkzTitrationStand</code>	Hotplate / stirrer support
<code>\tkzTitrationStirBar</code>	Magnetic stirrer bar
<code>\tkzPipetteBody</code>	Pipette body

Macro	Description
<code>\tkzLargePipetteBody</code>	Large pipette
<code>\tkzDrop</code>	Liquid drop
<code>\tkzGraduatedCylinderBody</code>	Measuring cylinder body
<code>\tkzGraduatedCylinderRim</code>	Measuring cylinder rim
<code>\tkzGraduatedCylinderBase</code>	Measuring cylinder base/foot
<code>\tkzGraduatedCylinderGraduation</code>	Measuring cylinder graduation
<code>\tkzDistillationFractionated</code>	Fractional distillation assembly
<code>\tkzBunsenBurner</code>	Bunsen burner
<code>\tkzFlameGrill</code>	Flame with grille
<code>\tkzBunsenBurnerGrill</code>	Bunsen burner with grille
<code>\tkzRoundFlaskSimple</code>	Round-bottom flask body
<code>\tkzRoundFlaskGrill</code>	Round-bottom flask with grille
<code>\tkzTestTubeStopper</code>	Test-tube stopper
<code>\tkzTestTubeBody</code>	Test-tube body
<code>\tkzTestTubeStraightTube</code>	Straight narrow tube
<code>\tkzTestTubeElbowTube</code>	Right-angled tube
<code>\tkzTestTubeUTube</code>	U-shaped tube
<code>\tkzTestTubeUTubeLong</code>	U-tube to bottom
<code>\tkzCurvedTube</code>	Curved exhaust tube (with burner)
<code>\tkzCurvedTubeShort</code>	Short curved exhaust tube
<code>\tkzTestTubeDoubleTube</code>	Double-tube assembly
<code>\tkzTestTubeClamp</code>	Test-tube clamp
<code>\tkzVolumetricFlask</code>	Volumetric flask
<code>\tkzCrystallizingDish</code>	Crystallising dish
<code>\tkzBeakerRim</code>	Beaker rim
<code>\tkzBeakerBody</code>	Beaker body
<code>\tkzErlenmeyerBody</code>	Erlenmeyer flask body
<code>\tkzReagentBottleBody</code>	Reagent bottle body
<code>\tkzWatchGlassBody</code>	Watch glass body
<code>\tkzWatchGlassBase</code>	Watch glass foot
<code>\tkzFunnelBody</code>	Funnel body
<code>\tkzCondenserStem</code>	Ball condenser stem
<code>\tkzCondenserBulbs</code>	Ball condenser
<code>\tkzHeaterRoundFlask</code>	Flask heater (mantle)
<code>\tkzRoundFlaskReflux</code>	Reflux flask assembly
<code>\tkzSeparatoryFunnelBody</code>	Separating funnel body
<code>\tkzSeparatoryFunnelOutlineClip</code>	Separating funnel clip path
<code>\tkzStopper</code>	Stopper (funnel)
<code>\tkzTapOpen</code>	Open tap
<code>\tkzTapClosed</code>	Closed tap
<code>\tkzStand</code>	Support stand

11 Version history and credits

`tikz-chemlab` (v1.0.0) is a TikZ port of `pst-labo` (v2.07, 2025/07/15) by Denis Girou, Christophe Jorssen, Manuel Luque, and Herbert Voß. The port was created by Aihua Wang.

Repository: <https://github.com/aihua/tikz-chemlab>

Support: <https://github.com/aihua/tikz-chemlab/issues>

The port preserves the original command names, option keys, default values, and visual appearance as closely as possible. All shape coordinates were derived from the original `pst-laboObj.tex`.

Key differences from `pst-labo`:

- Uses TikZ instead of PSTricks (no PostScript dependency; works with pdfflatex, xelatex, lualatex, tectonic).
- Line widths automatically scale with `scale` via `\chemlabUpdateLineWidths`.
- Six predefined line-width styles (`publication`, `draft`, etc.) not present in the original.
- Flame colours and scale are configurable via `\chemlabset{flame outer color=..., flame scale=...}`.