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EDITORIAL
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Widespread and specific tips for creating a graph

It is widely evident that contemporary scholar journals serve as a platform for exchange and discussion of new scientific results among various groups of people, including scientists, students, company representatives, governments, and others. To provide more insights into a problem stated and potential solutions, the authors usually provide their experimental and theoretical results with several specific items (tables, schemes, and graphs). Such a representation is intended to make more robust assumptions, to reveal relationships more clearly, to support formulated conclusions; obviously, many of these things are challenging to present and discuss solely in the form of text without any illustrations [1]. Furthermore, graphical elements assume a pivotal role in capturing the reader's attention in a dynamic and rapidly evolving environment [2].

The development of skills in constructing graphs comes from school, when books on natural science disciplines contain quite a lot of such elements. However, simply viewing graphs and working with their construction are not the same, especially for the preparation of manuscripts for their subsequent publication in scientific journals. A variety of software can be used to graph research data, but Excel and Origin remain the most popular among scientists. Good (attractive) graphs can be created in any software, regardless of its features; similarly, a bad drawing can also be produced if the user has not dedicated sufficient attention to improve it. These are simple truths, yet numerous examples of the second scenario are frequently published in scientific journals, including those with high impact factors. In order to guide authors, some journals publish editorials that highlight different important aspects of figure preparation, thus helping scientists to efficiently present their data. For example, figure size [3], number of panels [4], font design [5], and color palettes [6] have been analyzed in terms of achieving highly attractive figures. Following these activities, the editorial office of the Chimica Techno Acta journal also wishes to present several important points for readers, which can help them in designing clear, simple, but beautiful figures.

To show possible improvements via step-by-step, let's simulate a situation where the following experimental data (**Table 1**) needs to be displayed on a single panel figure.

Table 1 The experimental data used for the figure creation.

T (°C)	Amount of carbon (*y*), mol		
	*y*1	*y*2	*y*3
20	11.5	12.0	12.5
50	12.0	14.0	16.0
70	12.5	16.0	20.0
100	13.1	18.0	25.0
150	15.5	20.0	33.0

Microsoft Excel has been used for our purpose. **Scheme 1** shows first attempts to modify the originally generated graph. The improvements include:

1) Removing the grid. In most cases, the use of such a grid hinders the analysis of the presented data due to the excessive clutter of various elements of the graphs. When graphs contain a small number of symbols, the grid can be useful, especially when precise values are necessary for estimation from the abscissa and ordinate axes.
2) The removal of the external (gray) frame of the graph and the subsequent addition of the internal (black) frame. This is necessary to demonstrate the precise area of the figure.
3) Replacement of the gray color of the text elements of the graph with the black color to enhance the overall visual clarity.
4) The increase of the font size for all text elements of the graphs. When creating graphs, researchers should keep in mind that many journals have a two-column layout. Therefore, a single-panel figure will fill the entire width of one column or slightly less. In this case, the font size of the text elements in the graph must be comparable to the font size of the figure caption or main text. Otherwise, text with a smaller font size will be difficult to read against the background of the manuscript text. The same principle can be extrapolated for combined figures composed of several panels.
5) The correct scaling for abscissa and ordinate axes. Good graphs should not have a large amount of empty space (see the corresponding gray area). It is bet-

ter to show the dependencies over the entire scale of both axes, leaving some space for the legend.

The following steps are related to deeper changes in various graph elements. These steps are as follows (see **Scheme 2**):

1) Scaling of the graph. As-generated graphs in Microsoft Excel have a resolution of 12.70 × 7.62 cm² (their ratio is ~1.3). However, graphs look better for a ratio of 1.5 (or 12 × 8 cm² in width and height).
2) Bolding the axes name. This change results in the axis names being clearly distinguishable from the numerical values plotted on the corresponding axis.
3) Checking out the graph readability in grayscale mode. The symbols used must have different colors. This makes it easier to distinguish between different dependencies. However, researchers must remember that their published work may be printed for more careful reading. Therefore, the used colored symbols must also be distinguishable in grayscale. As shown in the detailed grayscale fragment, the symbols have low contrast, which complicates their relation to the legend.
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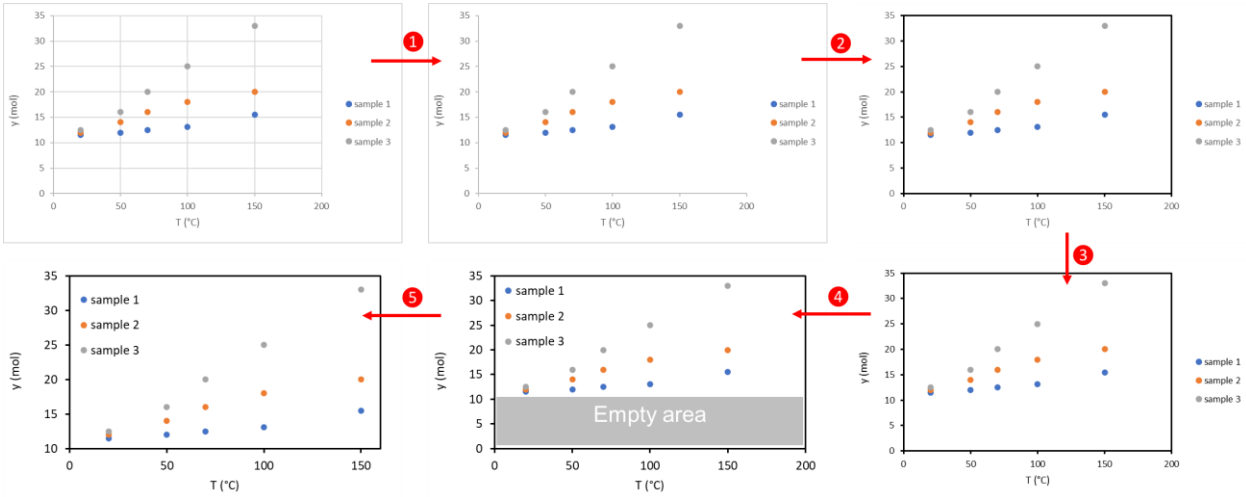
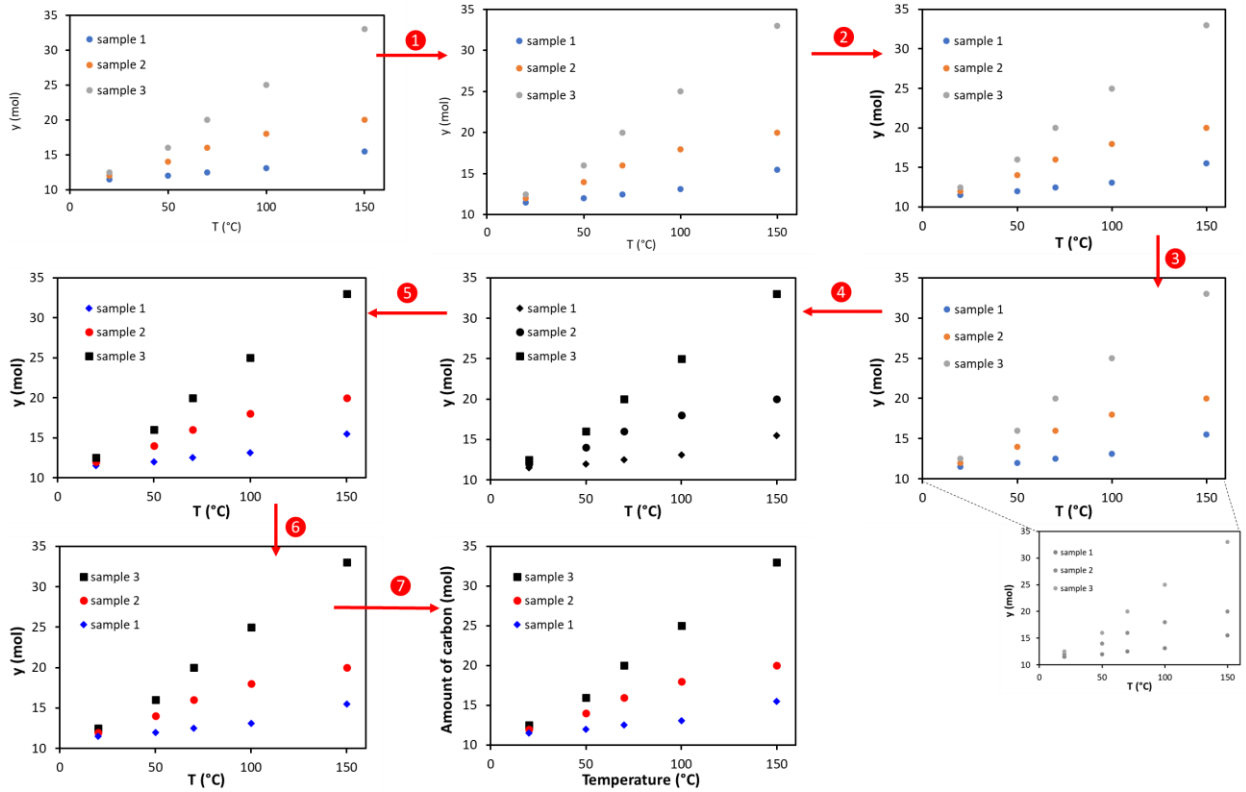


Scheme 1 First steps in the improvement of as-generated graph.



Scheme 2 Subsequent steps in the improvement of as-generated graph.

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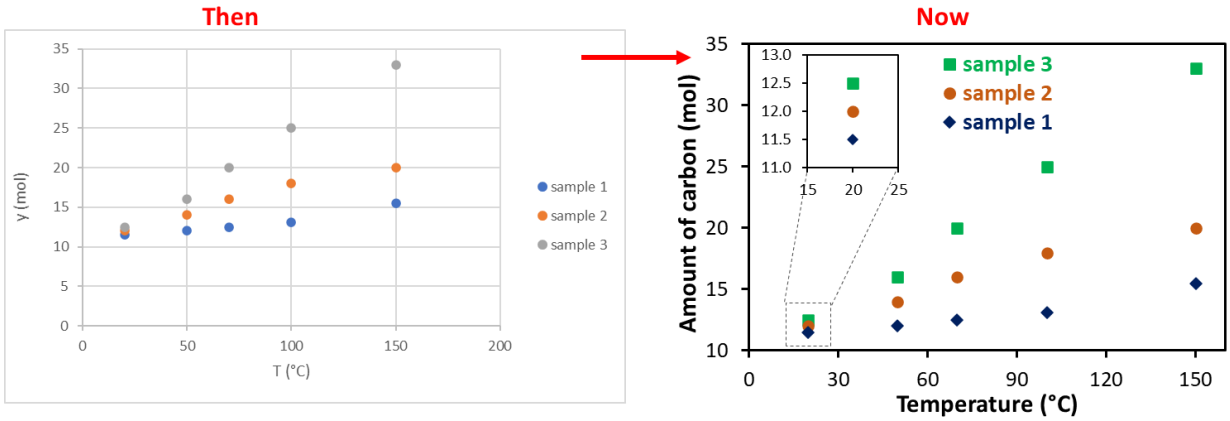

Scheme 3 The origin and final graph versions using Microsoft Excel.

5) Setting different symbols for various comparable systems (samples). This solves a problem of correct comparison, including the grayscale mode. However, almost all modern journals are published in electronic form. In this case it is better to use color.
6) A combination of different symbol shapes and their colors is the best choice to highlight each dependency on the graph.
7) For better readability, the order of listing systems (patterns) in the legend should match the order of the corresponding dependencies. In the presented case, the blue dependency is below the black and red dependencies. A similar order is used in the legend.
8) In the axis names, simple physical quantities are usually replaced by their terms instead of symbols. For the presented case, 'T' is replaced with 'Temperature', while 'y' is replaced with 'Amount of carbon'. This also simplifies the reading, making the graphic itself readable, without having to refer to the figure caption or other manuscript places where the meaning of the symbols is explained. The corresponding units are usually given in round brackets (Temperature (°C)) or through a slash (Temperature/°C) depending on the journal's style.

There are a few other aspects that can help in creating the graphs. One of them is the appropriate number of axis divisions. Eight numerical values plotted on the ordinate axis of the original graph seem to be too many; 4–5 divisions for each axis are appropriate for most cases. To show personality of your work, the conventional color combination (black, blue, and red) might be replaced with other interesting colors. The same applies to the text font style, but useful tips on this aspect have already been given recently in [5]. In cases where a part of several dependencies overlaps (or the dependences have close values in a certain range), the inclusion of an inset with a magnified section is particularly advantageous, especially if this is important for discussion.

In summary, the utilization of the aforementioned strategies enables the conversion of a standard Excel graph design into a well-readable and clear analog (**Scheme 3**). We should repeat again that the provided step-by-step tactic is fully applicable to a broader spectrum of graphical software, each with its own set of default features. The present editorial is dedicated to the preparation of single-panel figures. However, it should be noted that such figures can be arranged in a more complex configuration by utilizing several separate panels. Subsequent editorials will address issues in organizing other manuscript items (complex figures, color filling, tables).

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Sincerely,
editorial office members

Dmitry Medvedev [ab] *
a: Ural Federal University, 620002 Yekaterinburg, Russia
b: Institute of High Temperature Electrochemistry, 620066 Yekaterinburg, Russia
* Corresponding author: dmitrymedv@mail.ru

Pavel Padnya [c] *
c: A. M. Butlerov Chemistry Institute, Kazan Federal University, 420008 Kazan, Russia
* Corresponding author: padnya.ksu@gmail.com

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