

What changes can I make?

Although the template is designed to standardise the presentation of information, please don't feel that you can't amend it to suit your needs.

If you have any problems using the template feel free to go to our dedicated conference/research poster webpage which shows examples and technical guidelines on creating posters: www.reading.ac.uk/dps/conferenceposters

Don't change ...

- **Page size** should remain the same: changing the page size can distort the fixed content in the template, e.g. the University device (logo) can become stretched.
- **Position and size** of the University device and unit name.
- **Top banner** must stay the same depth. This helps keep the spacing of all the different elements standardised.
- **Fonts:** the University font 'Rdg Vesta' is used as the display font. This is mandatory, though you can continue to use other fonts as necessary in order to best represent mathematical or scientific symbols of any kind.
- **UROP box:** please leave the UROP box at the bottom untouched.

Change if you need to ...

- **Author's name:** please amend to include your name on the top banner.
- **Text size:** the size of the text in the title is set quite large, to encourage you to write short titles that are visible from a distance. If you really do need a long title, you can manually shrink the text.
- **Colours:** the template comes with nine University colours to choose from. We have started with blue but feel free to change to one of the other Rdg colours.

How to save your file as a pdf

You will need to save your PowerPoint file as a pdf - this is the only format that will be accepted for printing. To do this just follow these instructions:

Within PowerPoint, select File>Save As (or Office Button>Save As if you are using Office 2007). This will bring up a dialog box.

Name your file and select an appropriate location to save it to.

Within the drop down menu Save as type, select PDF (*.pdf). The options at the bottom of the box will change.

Ensure that: Open file after publishing is ticked (this will open the completed pdf), Standard (publishing online and printing) is selected.

Select Save.

Emphasising content

There are several good ways to pick out important concepts within a poster. Here are a few you might find useful.

Headings

- Shows the structure of the whole poster
- Top-level headings are usually: Introduction, Method and Conclusion

Introduction

The overall aim of our templates is to help staff produce posters that present research findings easily in a way that is accessible to the reader, but also gives a professional, consistent appearance that correlates with other University documents.

Bold

- Useful to highlight words within a paragraph
- You can make a whole paragraph bold:
 - + draws attention
 - can make it hard to read in long paragraphs
- Don't use bold throughout

You can change the colour scheme of your poster at any time via **Design > Colours** then click on the 'Colours' options arrow. A list of the University colours will appear (they are all prefixed with Rdg conference poster). There are nine to choose from and changing a colour scheme will change all the colours with one click.

Changing fonts and shape colours manually is very time consuming and is not recommended.

Bullets

- Perfect for any kind of list
- Can be a numbered list, if useful

Change if you need to:

- Columns: you can use a different number of columns but aim for 8-12 words per line of text
- Layout: the layout of boxes and text is flexible
- Headings: there are three headings built in, you can create more if you need to
- Text size: the size of the text in the title is set quite large, to encourage you to write short titles. You can manually shrink the text if you need a longer title.

Boxes

- Better for peripheral information, not the main narrative
- Good for drawing attention to diagrams, tables or charts

References

1. Author's name, Book title, (Publisher: Year) pp. XX-YY
2. Author's name, 'Article title', Journal title, publication info, pp. AA-BB
3. Researcher's name, Institution

Acknowledgements

- Write here anyone you would like to thank. It works best if this list is bulleted.
- Another person to thank here.

Contact information

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- Email: person@reading.ac.uk | www.reading.ac.uk/xxxxxxxxxx

Good example

This is an example of good example of how to layout a conference or research poster.

- Page size is the same as the template: A1 (594 mm x 841 mm).
- The colour used is one of nine University colour schemes already built into the templates.
- The University device is in the correct size and position.
- The layout of the banner text at the top is consistent with the original template.
- Correct use of margins and columns with a reasonable gutter between them.
- Easy to read and navigate around the poster.
- Correct fonts are used (Rdg Vesta) throughout.
- Good use of headings to break up text.
- No overlapping text or diagrams.
- References and contact information are clearly laid out and legible.

Department of Chemistry

Thermal transition determination of carboranylene-containing poly(carbosiloxane)s and poly(carbosilane)s

Author 1 | Author 2 | Author 3 | Author 4



Polycarbosilanes and polycarbosiloxanes

Polymers containing carbon to silicon covalent bonds and *m*-carboranylene icosahedra ($C_2B_{10}H_{12}$) in the backbone are called poly(*m*-carborane-1,7-diylicarbosilanes). Analogous polymers with Si-O backbone bonds are called poly(*m*-carborane-1,7-diylicarbosiloxane)s. These polymers are of interest as potential thermally stable, low T_g materials. A series of these polymers, both straight-chain and crosslinked, has been prepared (Figure 1).

Correlations between crosslinking and glass transition temperature (T_g) of these polymers are of interest in material design, where polymers with a desired T_g can be designed and synthesised.

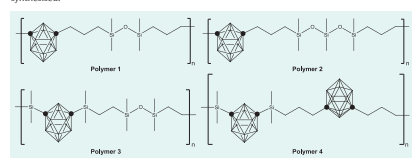


Figure 1 – Straight chain polymers whose thermal transitions have been analysed by MDSC. Unlabelled icosahedron vertices correspond to BH groups and black dots correspond to carbon atoms.

Thermal transitions of carborane-containing poly(carbosilane)s and poly(carbosiloxane)s

Thermal transitions are not always discrete like those of linear poly(dimethylsiloxane) [-120 °C (T_g), -80 °C (T_m) and -40 °C (T_m)] heat flow changes associated with simultaneous transitions are observed together in thermograms with consequentially ambiguous onsets, ends- and mid-points. Polymers 1 to 4 presented here undergo simultaneous thermal transitions and glass transitions on cooling. Accurate determination of T_g values, necessary to derive correlations between T_g and crosslinking in these polymers, is not possible using conventional DSC analysis. To accurately determine T_g values of these materials it is first necessary to separate heat flow change associated with a glass transition from heat flow change associated with relaxation/tensions, achievable through employment of temperature-modulated DSC (MDSC).

Temperature-modulated DSC

Modulated differential scanning calorimetry (MDSC) can separate enthalpies of transitions that occur reversibly from those that occur irreversibly by employing a sinusoidal oscillation in temperature, superimposed on a conventional constant heat rate δT_g [$\delta T = \langle \delta T \rangle$, where T_g is the temperature of the heating chamber (Figure 2). The sample temperature (T_s) is defined at steady state by the following expression:

$$T_s(t) = T_0 + \langle \delta T \rangle + \frac{C_p}{K} + A \sin(\omega t - \varepsilon)$$

where T_0 is the start temperature, C_p is the heat capacity of the sample plus pan, K is Newton's law constant for heat flux, A is the maximum amplitude of $T_s(t)$ modulation, ω is the angular modulation and ε is the phase shift relative to the temperature oscillation of the heater.²

A similar expression for the reference temperature (T_r) can be written, where A_r is the maximum amplitude and ϕ is the phase shift:

$$T_r(t) = T_0 + \langle \delta T \rangle + \frac{C_p}{K} + A_r \sin(\omega t - \phi)$$

The temperature difference, ΔT , is then proportional to the heat flow.

$$\Delta T = T_r - T_s$$

Heat flow following temperature modulation measures reversible heat capacity. Total heat capacity can be extracted from MDSC and the reversible heat capacity subtracted to calculate non-reversible heat capacity. Detailed accounts of MDSC can be found in the literature.^{2,3}

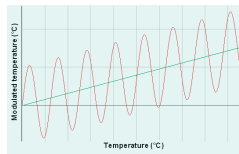


Figure 2 – A sinusoidal temperature modulation (red) superimposed on a constant heat rate (green).

MDSC: T_g Elucidation

Modulated differential scanning calorimetry was conducted at an average cooling rate of 3 °C min⁻¹ with an amplitude of ± 1.0 °C and a period of 60 s. Samples were heated isothermally at 100 °C for 5 minutes, then cooled to -70 °C. These conditions offer a high heat flow exchange and multiple heating and cooling rates in a single cycle. The MDSC thermogram of straight-chain Polymer 1 is shown (Figure 3), with total, reversible and non-reversible heat flow.

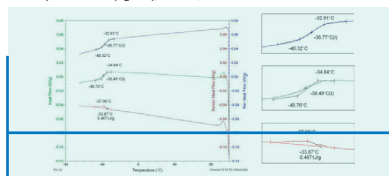


Figure 3 – MDSC thermogram (left) of Polymer 1 (100 °C to -70 °C) and expansions (right). Total heat flow (green) is separated into reversible (blue) and non-reversible (red) components.

MDSC thermograms of Polymers 1 to 4, including crosslinked derivatives of Polymers 1 and 2, were obtained and determined T_g values are presented (Table 1).

The mean difference in T_g measured by total heat flow (DSC) and reversible heat flow (MDSC) is 1.6 °C, but the non-uniformity of this error causes, more interestingly, a vast difference in the derived binomial correlation of T_g with crosslinker concentration (Figure 4). This would have negative repercussions for polymer design, for which accurate transition temperatures are sought.

Table 1 – T_g values of Polymers 1 to 4 measured by change in total heat flow (DSC) and change in reversible heat flow (MDSC).

Sample	Crosslinker concentration / mol %	T_g , DSC / °C	T_g , MDSC / °C
Polymer 1	0	-58.89	-59.77
Polymer 1 T1	1	-59.62	-58.59
Polymer 1 T2	2	-60.22	-59.22
Polymer 2	0	-49.68	-51.14
Polymer 2 T1	1	-49.94	-48.84
Polymer 2 T2	2	-49.82	-48.42
Polymer 2 T3	3	-47.65	-47.46
Polymer 2 T4	4	-48.83	-46.94
Polymer 2 T5	5	-48.65	-46.42
Polymer 3	0	-36.12	-33.37
Polymer 4	0	13.21	16.89

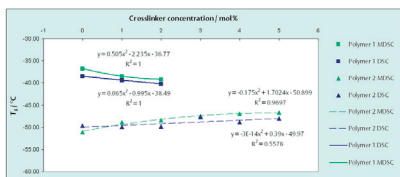


Figure 4 – Graph of crosslinker concentration vs T_g measured by total heat flow analysis (DSC) and reversible heat flow analysis (MDSC).

Summary

The glass transition temperatures of a series of novel carboranylene-containing polymers have been determined by DSC analysis. Binomial correlations of T_g with crosslinking have been derived for Polymers 1 and 2, and a significant improvement in T_g accuracy has been achieved through the employment of temperature-modulated DSC (MDSC).

References

1. J. Friedrich and J. F. Rabolt, *Macromolecules*, 1987, 20, 1975-1978.
2. B. Wunderlich, Y. Jin and A. Balle, *Thermochim. Acta*, 1994, 238, 277-293.
3. I. Okazaki and B. Wunderlich, *Macromolecules*, 1997, 30, 1758-1764 and references therein.

Contact information

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