Material Property Game

Solution Posters

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This document contains the solution posters for this game.

Like stated in the Facilitator's guide, we recommend a minimum of five different material samples for this game.

The solution guides provided with this resource use hand-drawn board template with the following five materials:

1. Glass (soda-lime)
2. Wood (pine)
3. Polymer (Polypropylene)
4. Copper
5. Stainless steel

To support if you are unable to find the exact materials we used for our solution guides (or choose to use more materials- check the facilitator's guide for ideas!), we have provided an empty template, as well as the exact data values we used to create the solution posters. Feel free to create your own solution guides, based on your supplies.

NOTE: Some properties are very close to each other in terms of values. Given that some of these measurement techniques might vary in accuracy, notes have been made on the solution guides to help.

Table of Contents

Solution Example Material Data

As stated above, we are providing the exact data values we used to create the solution posters in this guide. You can find the values in the table below.

All of this data was sourced from Ansys Granta EduPack™, a teaching software for materials education[1].

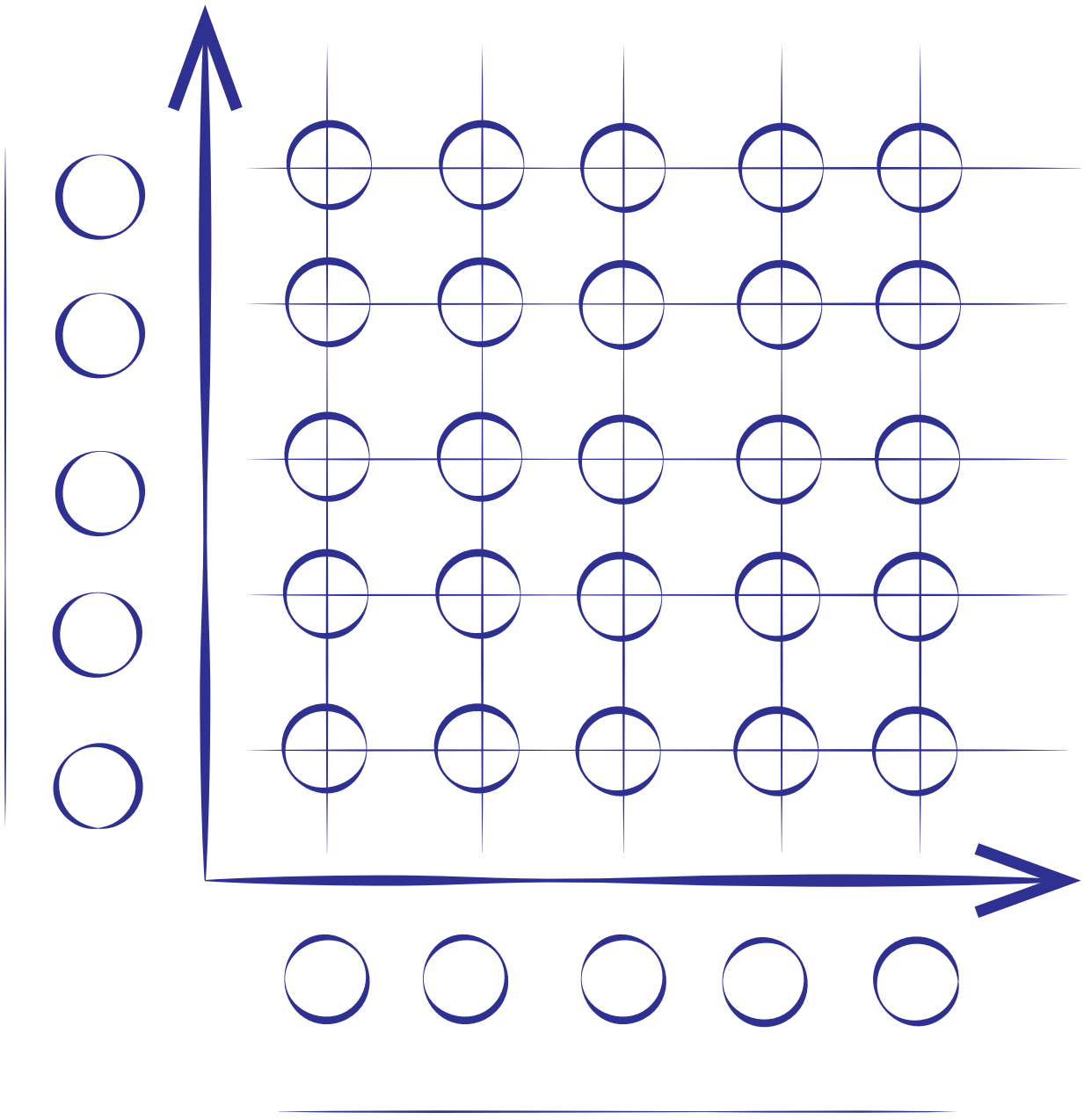
The data values highlighted in gray are from the Level 2 database.

The data values highlighted in gold are from the Design database, specifically looking at the *Aesthetic Attributes* section. These values are a combination of multiple material properties to help "rank" materials on aesthetics. Hence the numbers.

Material ↓ / Properties →	Density [kg/m³]	Mechanical Loss Coefficient	Electrical Resistivity [µohm.cm]	Thermal Conductivity [W/m·C°]	Dielectric Constant	Touch	Pitch	Tactile Warmth
Soda-lime glass	2,460	8.12×10^{-4}	2.51×10^{18}	0.954	7.15	4	6	3
Softwood, pine	514	0.0317	3.83×10^{14}	0.106	5.57	0	2-3	1
Polypropylene	902	0.356	1.47×10^{23}	0.195	2.2	0-1	2-3	2
Copper	8,940	3.48×10^{-4}	2.61	272	N/A-conductor *Considered to be low*	2-3	5	8-10
Stainless Steel	7,740	6.1×10^{-4}	74.6	18.7	N/A-conductor *Considered to be low*	3-5	6	5-6

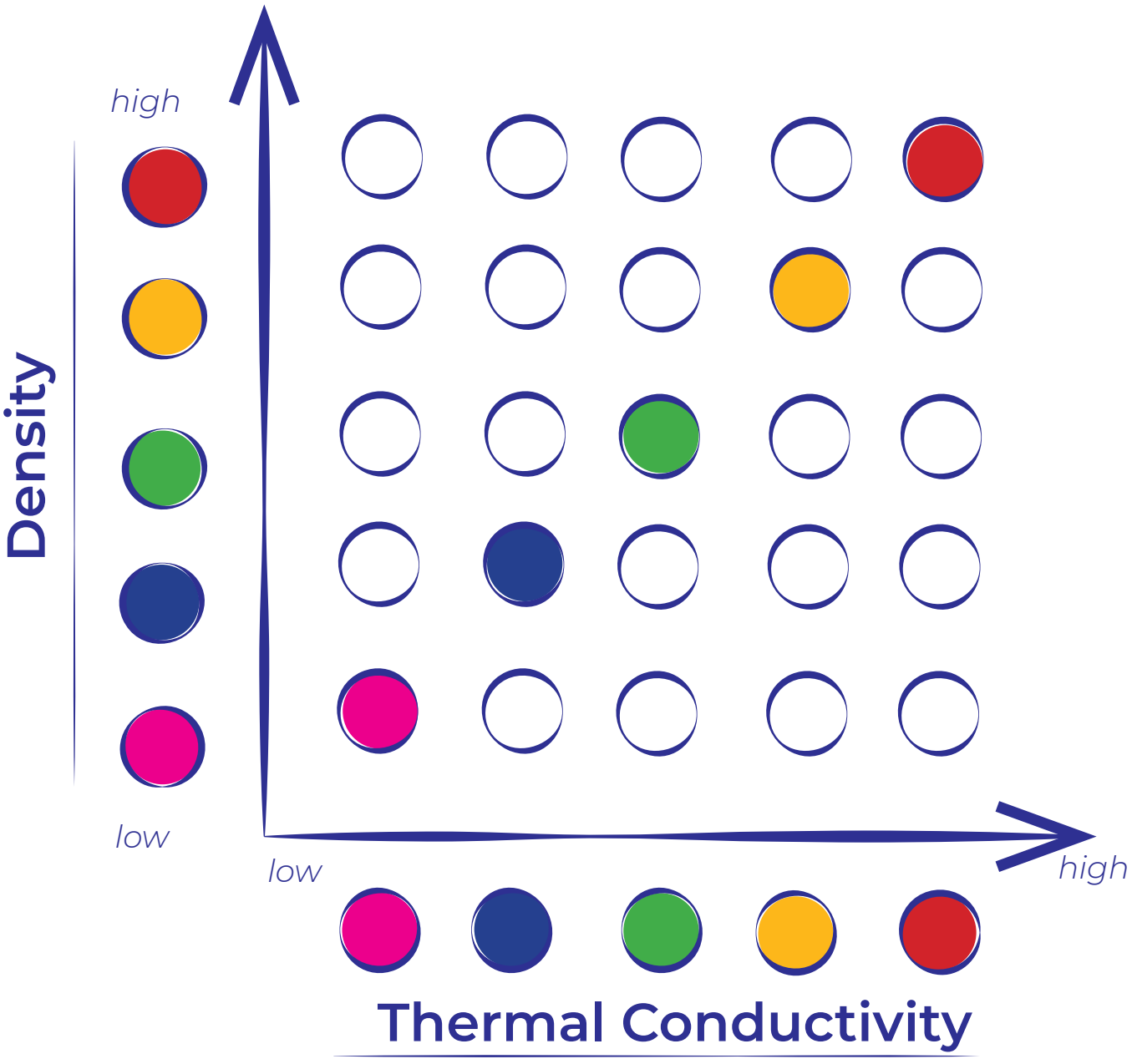
1 Don't have access but are interested in learning more? Check out our product webpage here or email us at education@ansys.com!

Hand-drawn Solution Poster Template



Materials Key

Density and Thermal Conductivity

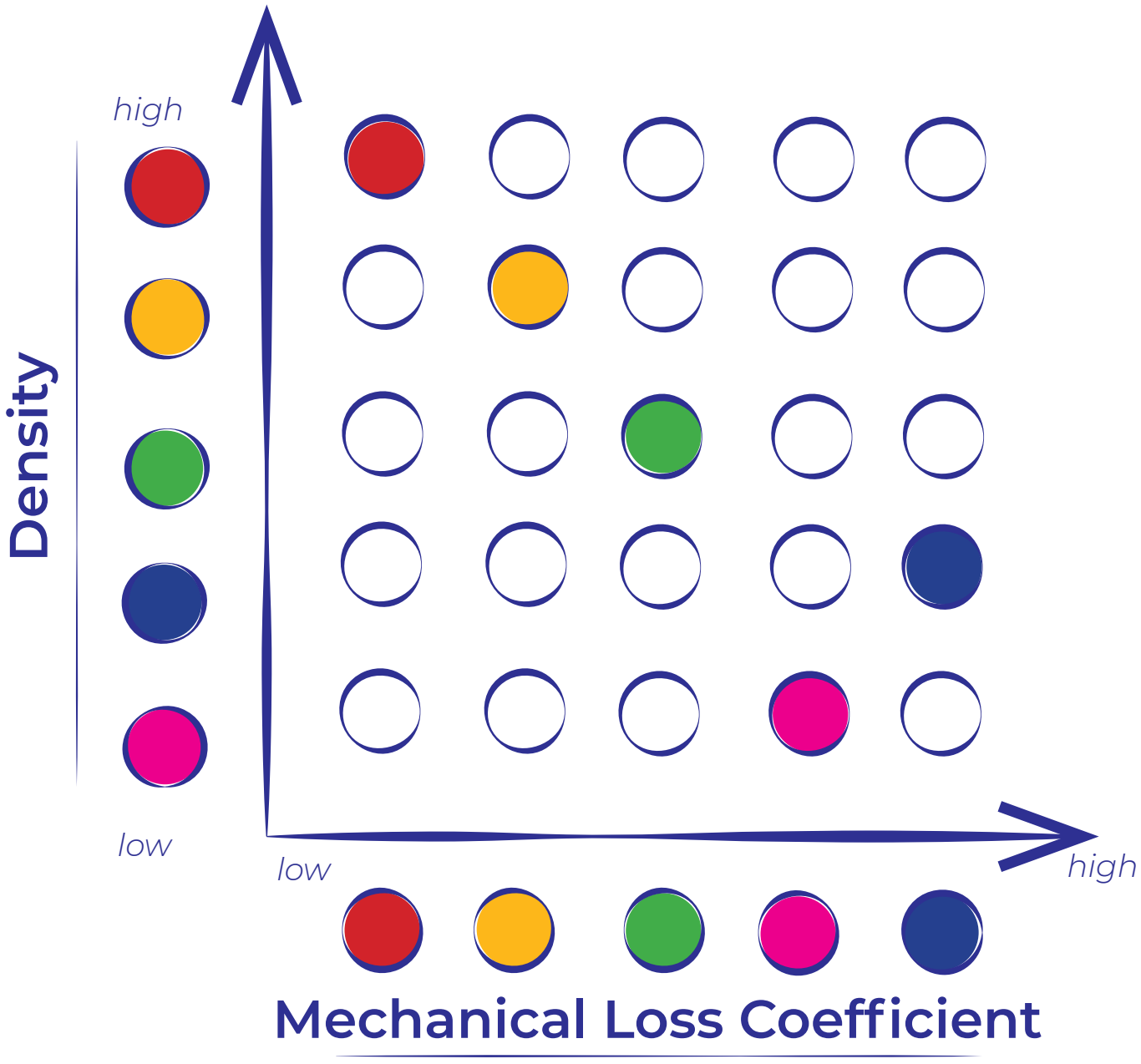


NOTE: thermal conductivity for pine and polypropylene are very similar. If the values are swapped in your answer- it is still correct!

Materials Key

- Copper
- Soda-lime glass
- Pine
- Stainless Steel
- Polypropylene

Density & Mechanical Loss Coefficient



Materials Key

- Copper
- Soda-lime glass
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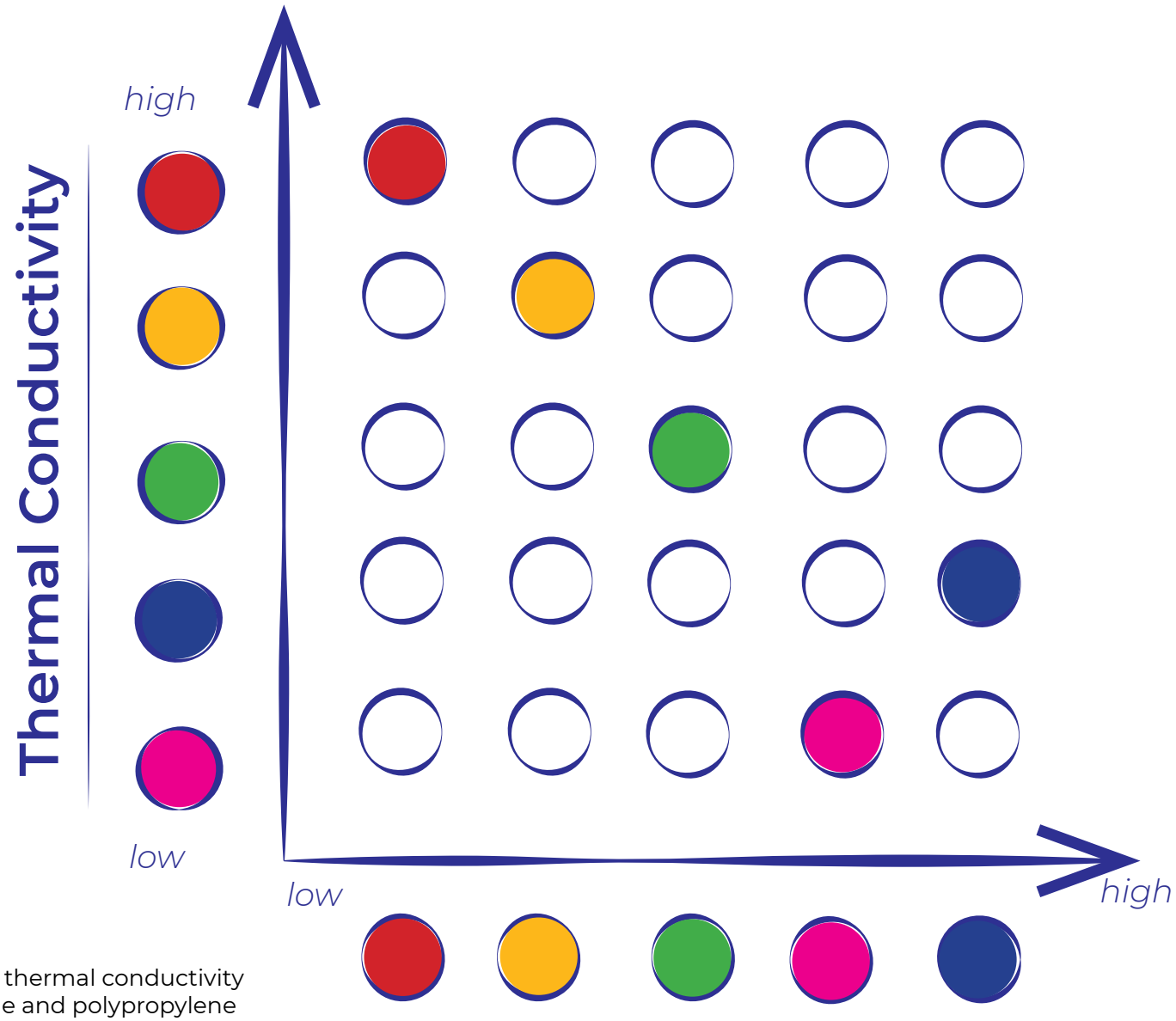
- Polypropylene

Thermal Conductivity & Mechanical Loss Coefficient



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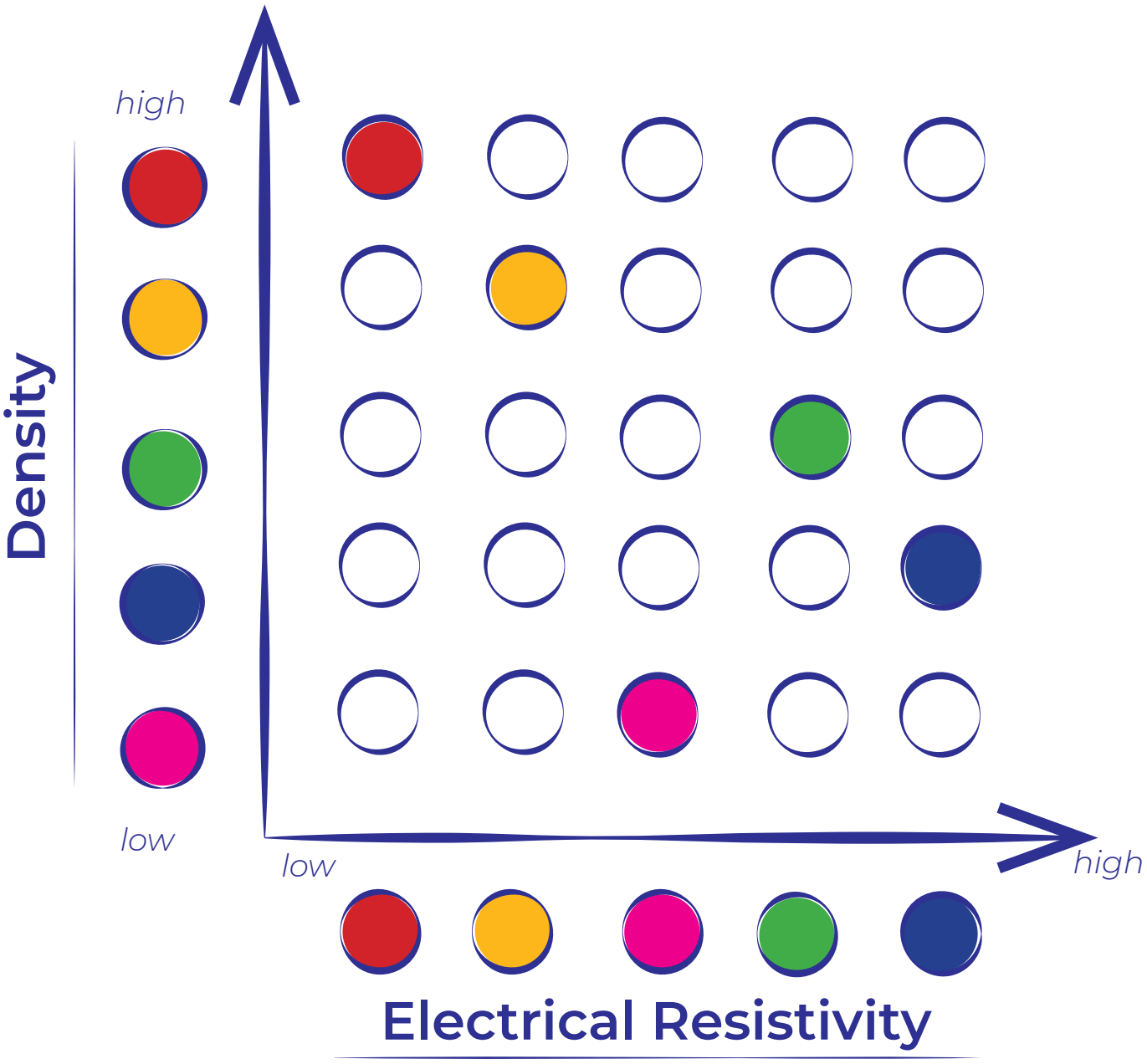
Density & Electrical Resistivity



Materials Key

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- Soda-lime glass
- Pine
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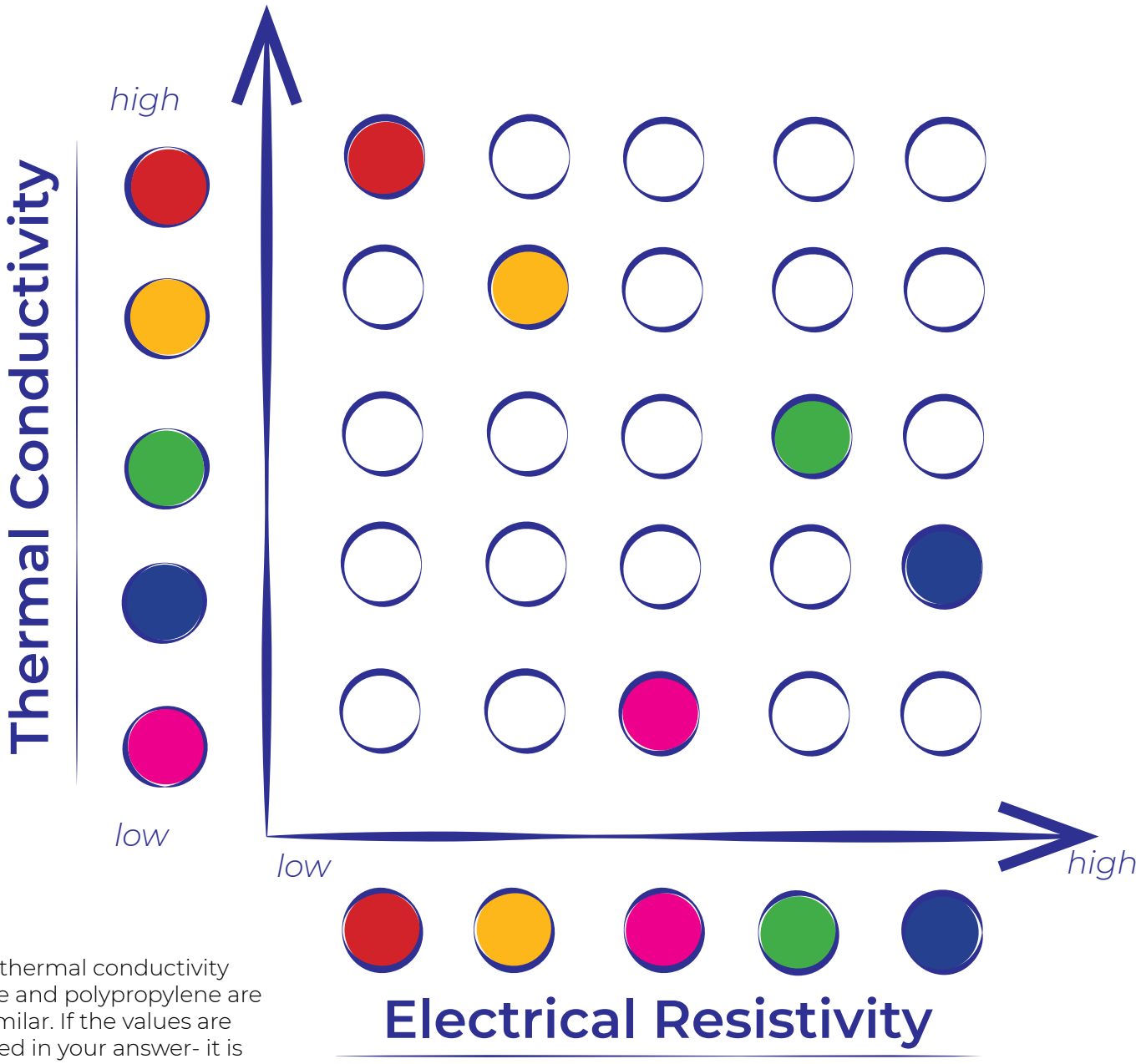
- Polypropylene

Thermal Conductivity & Electrical Resistivity



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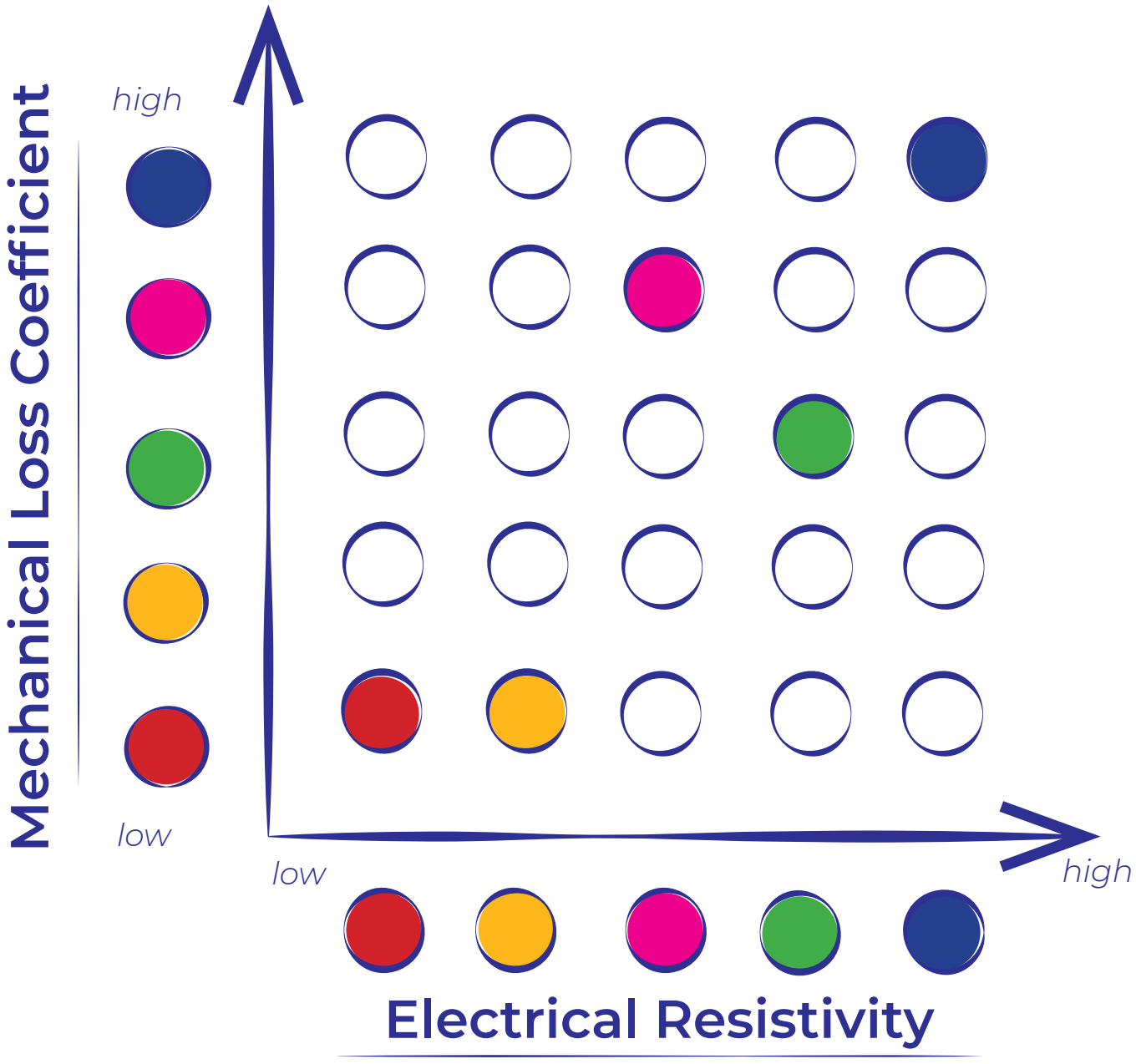
Mechanical Loss Coefficient & Electrical Resistivity



Materials Key

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- Soda-lime glass
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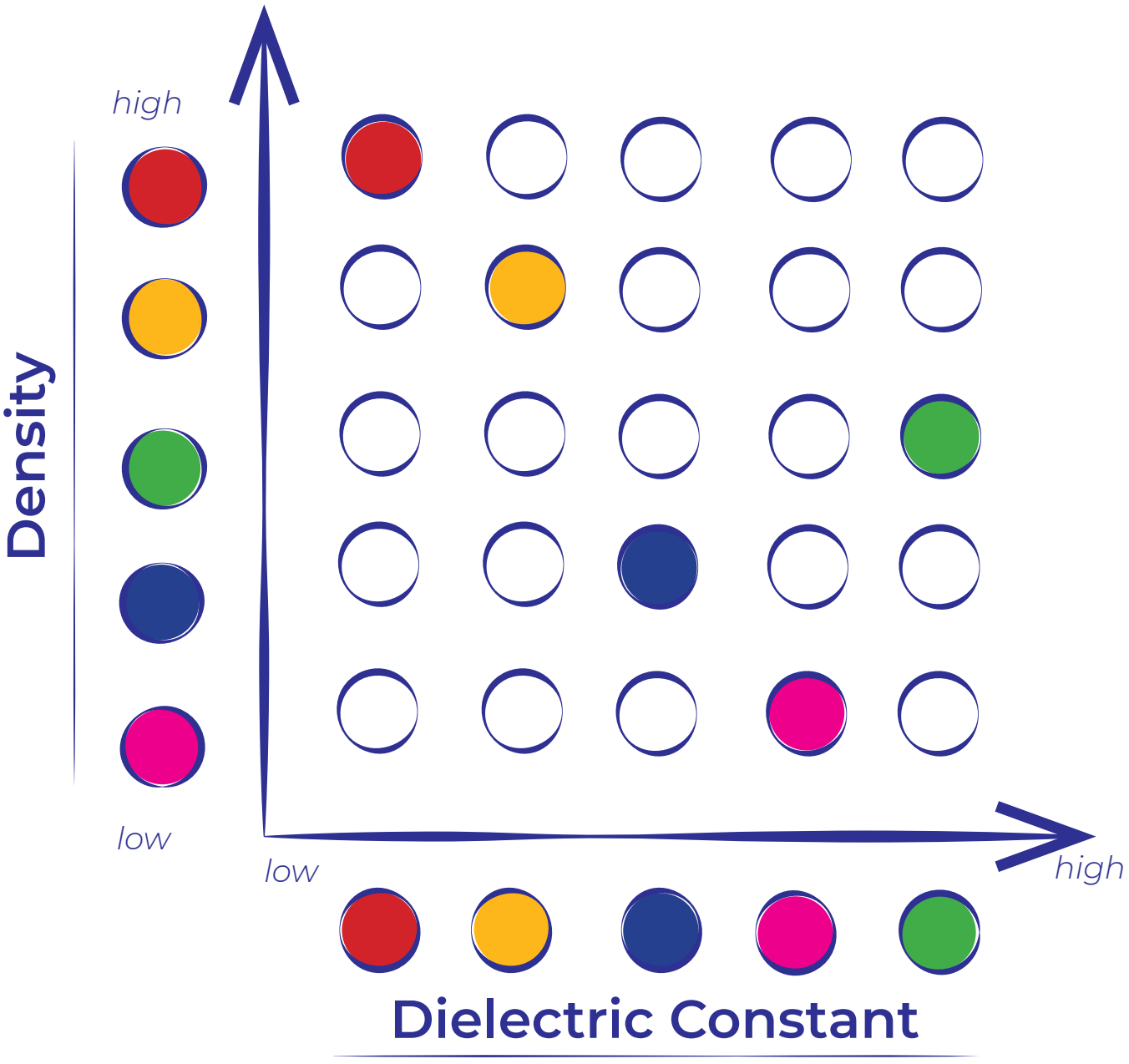
- Stainless Steel
- Polypropylene

Density & Dielectric Constant



NOTE: dielectric constant is very low for metals- therefore copper and stainless steel have similar values. If the values are swapped in your answer- it is still correct!

Materials Key

- Copper
- Soda-lime glass
- Pine
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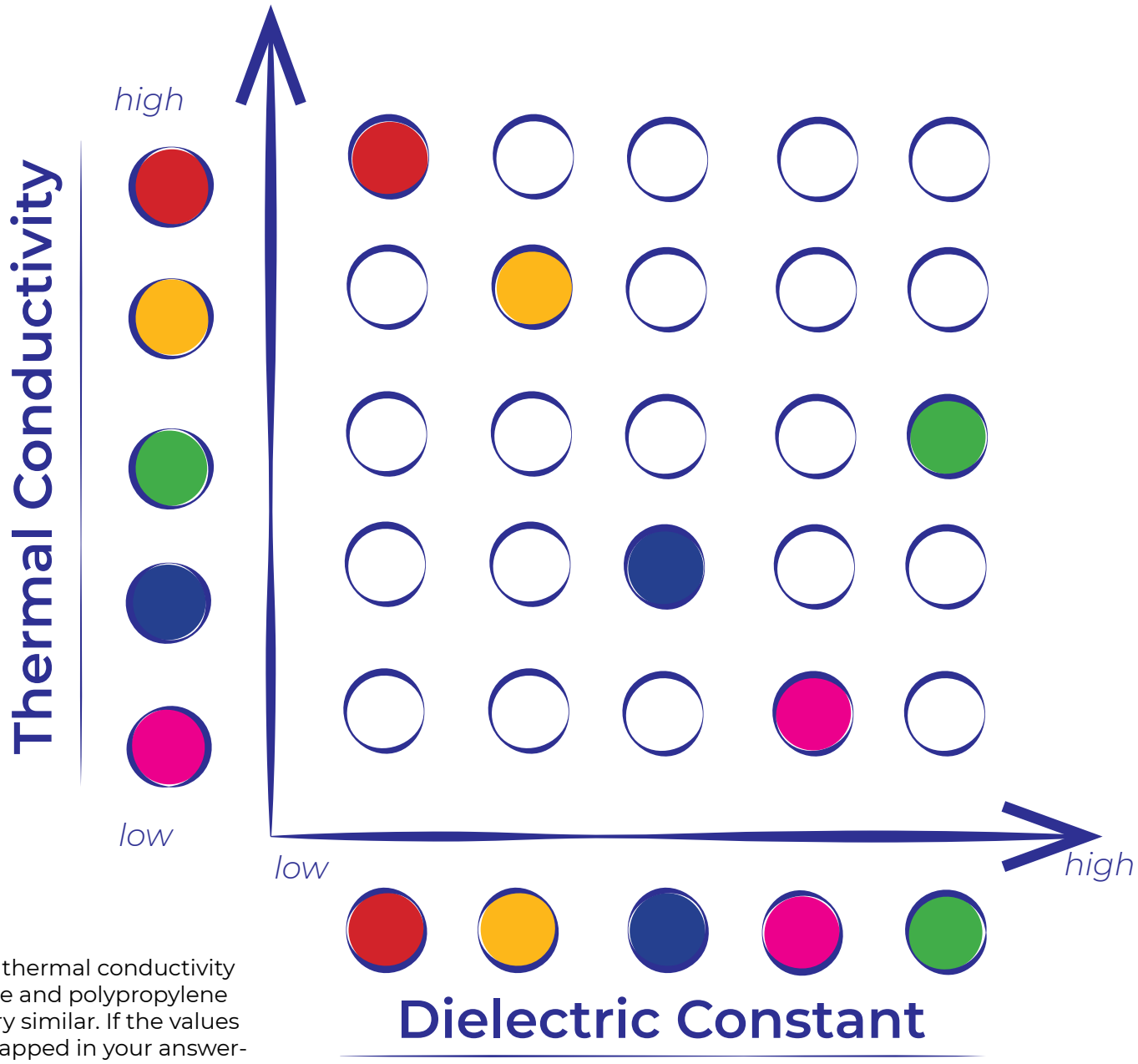
- Polypropylene

Thermal Conductivity & Dielectric Constant



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- Pine
- Stainless Steel
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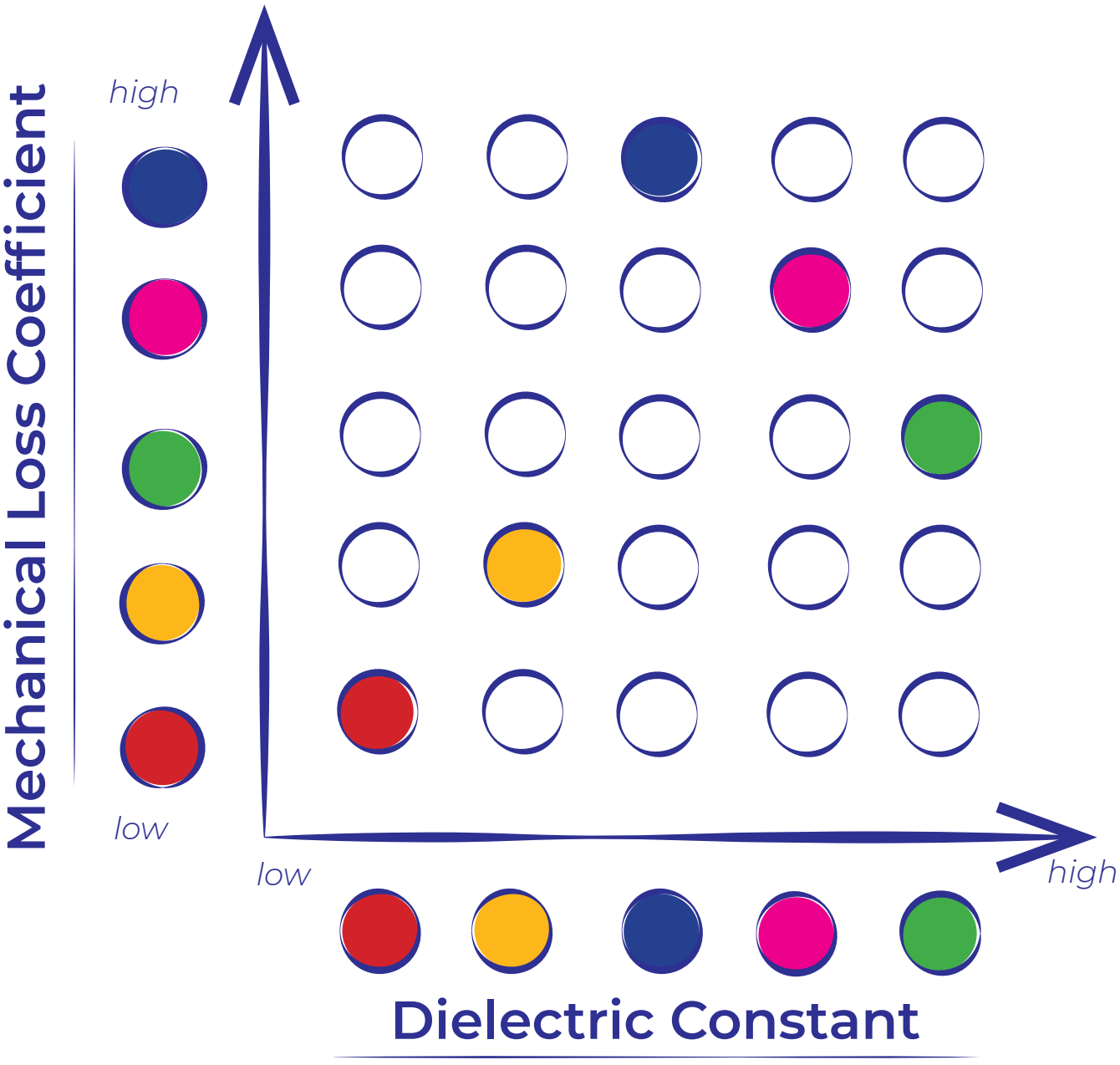
Mechanical Loss Coefficient & Dielectric Constant



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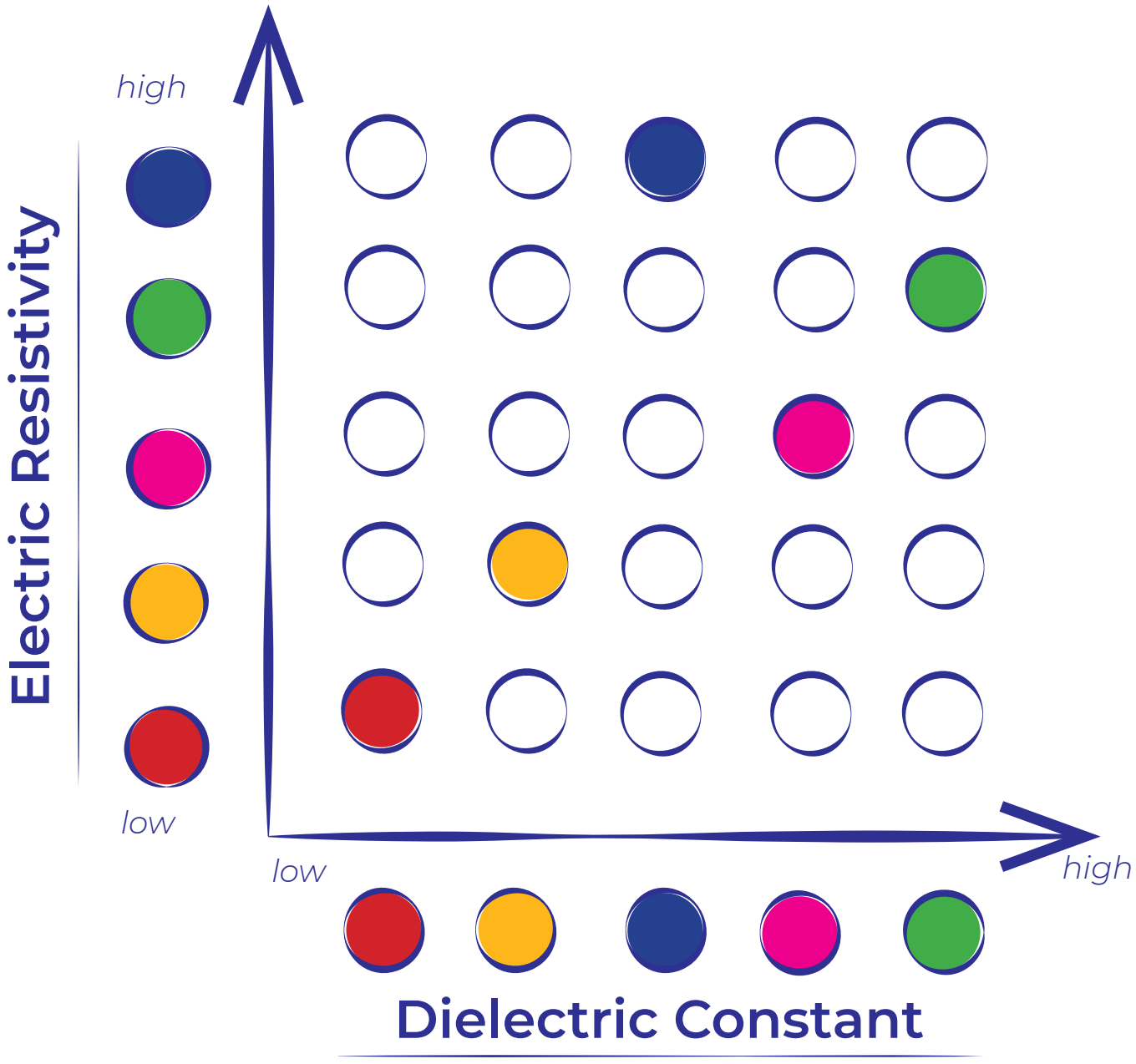
Electric Resistivity & Dielectric Constant



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Materials Key

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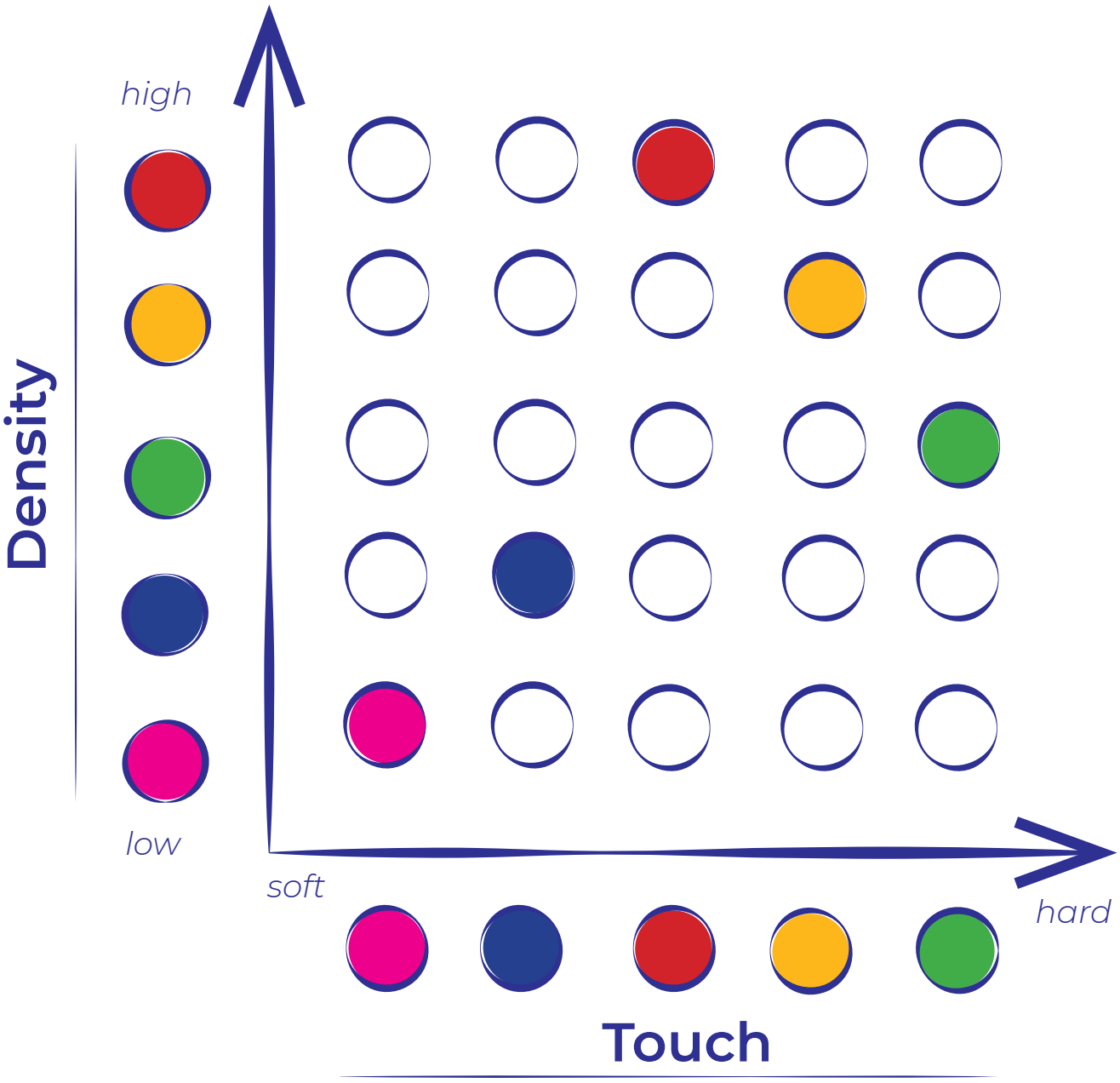
Density and Touch

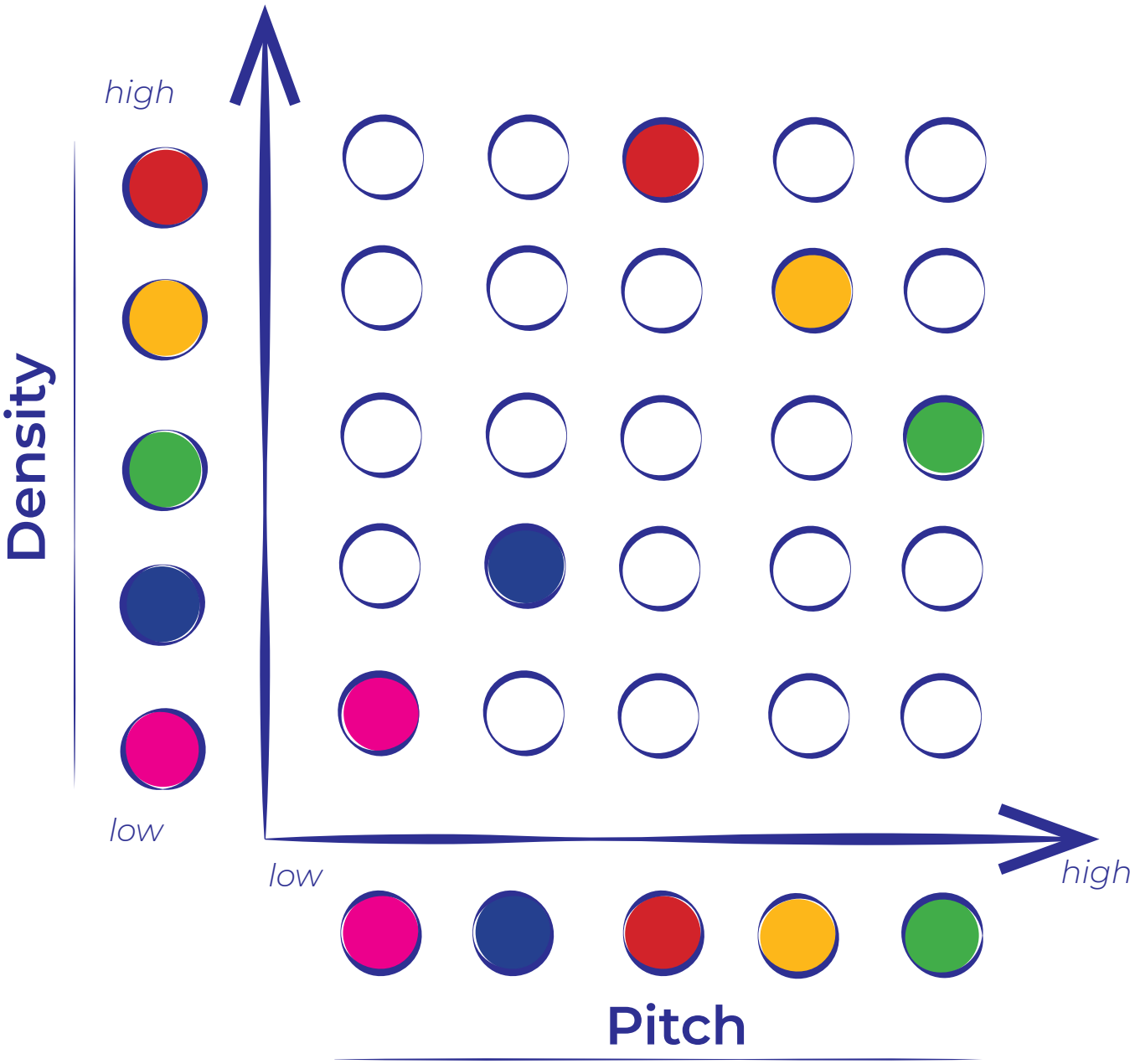


NOTE: Touch has very similar values for soda lime glass and stainless steel.
If the values are swapped in your answer- it is still correct!

Materials Key

- Copper
- Soda-lime glass
- Pine
- Stainless Steel
- Polypropylene

Density and Pitch



NOTE: Pitch has very similar values for soda lime glass/ stainless steel AND polypropylene and pine.
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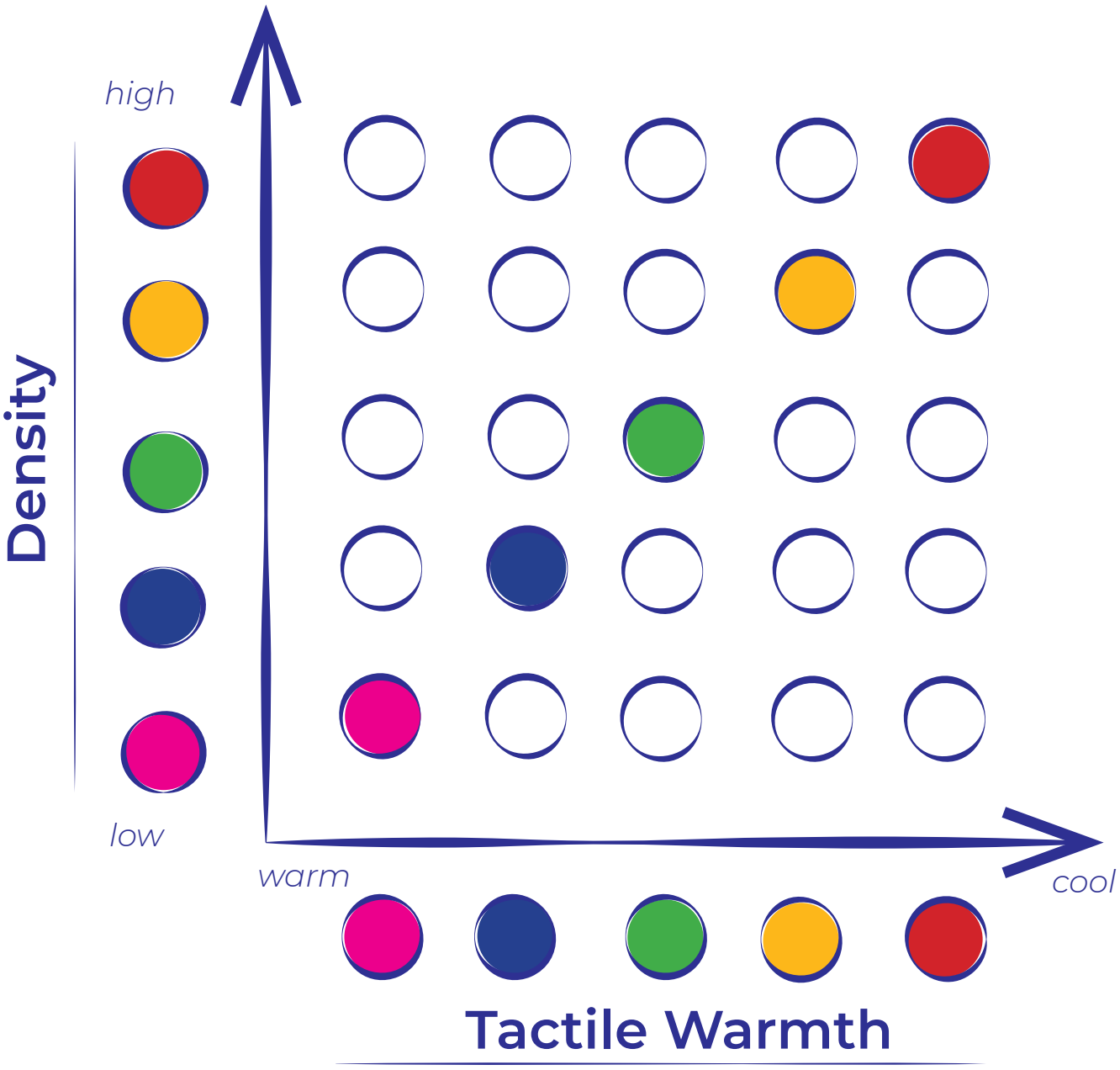
Materials Key

- Copper
- Soda-lime glass
- Pine
- Stainless Steel
- Polypropylene

Density and Tactile Warmth



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- Stainless Steel
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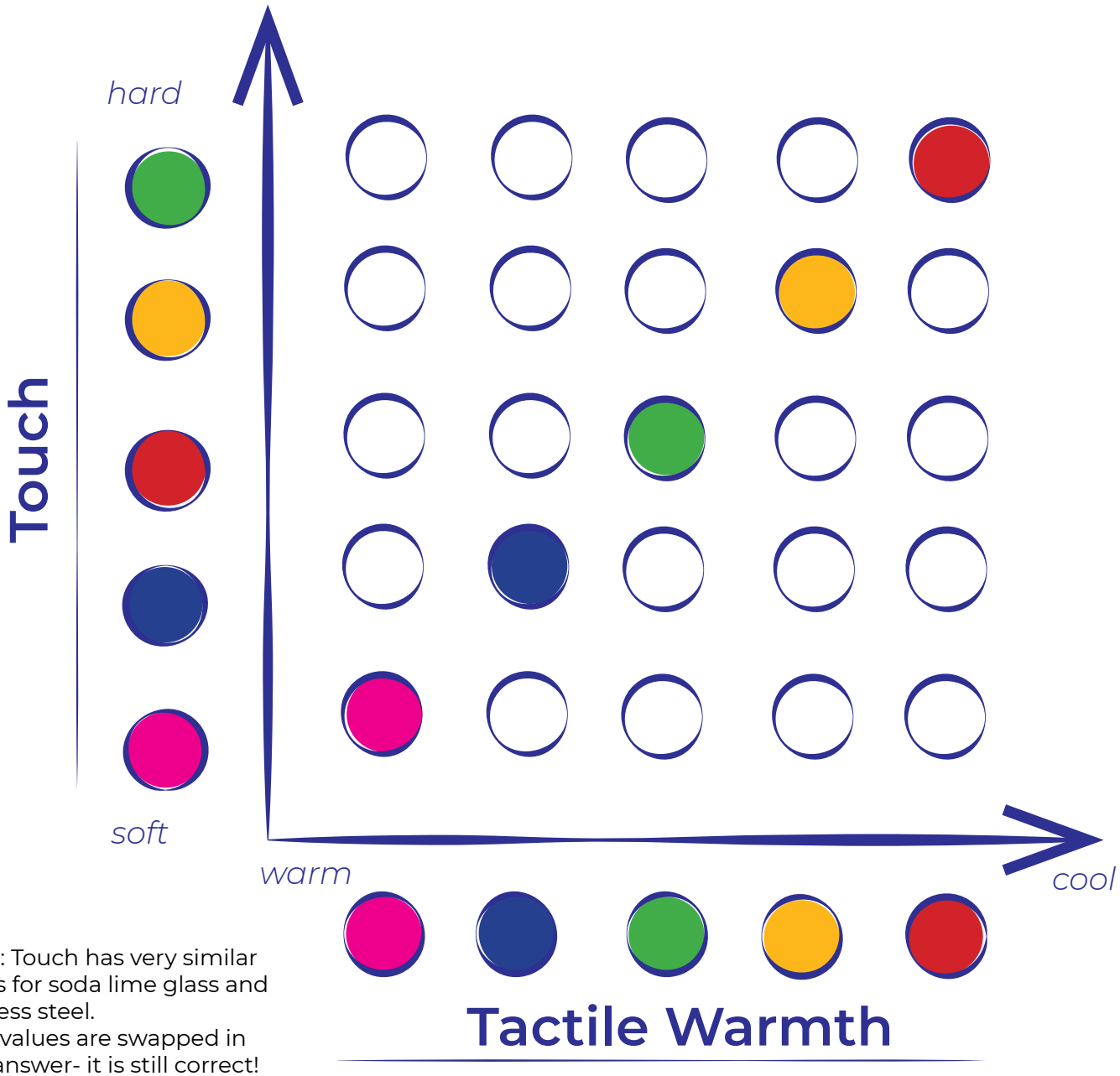
Touch and Tactile Warmth



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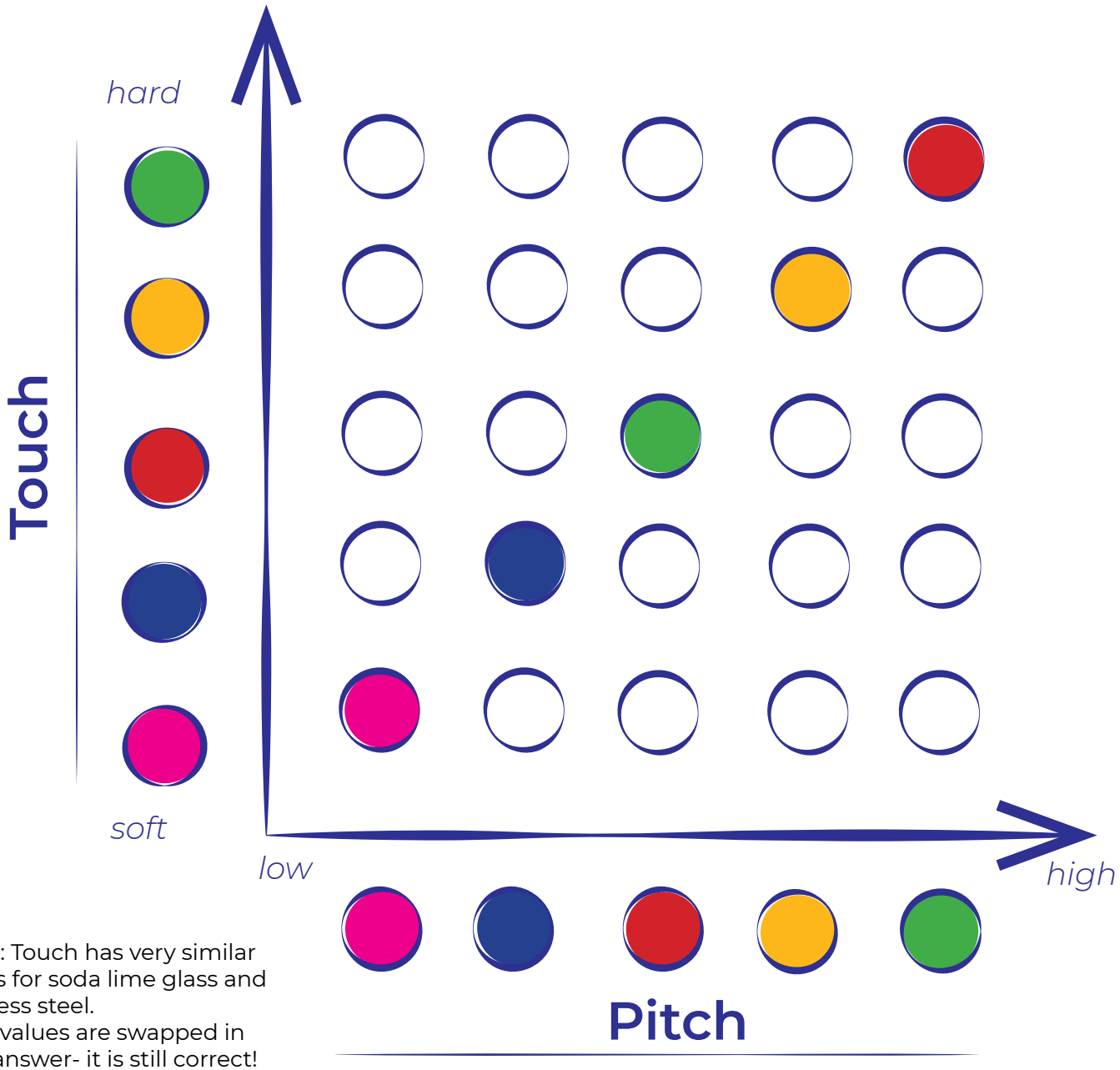
Touch and Pitch



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NOTE: Pitch has very similar values for soda lime glass/ stainless steel AND polypropylene and pine.
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- Pine
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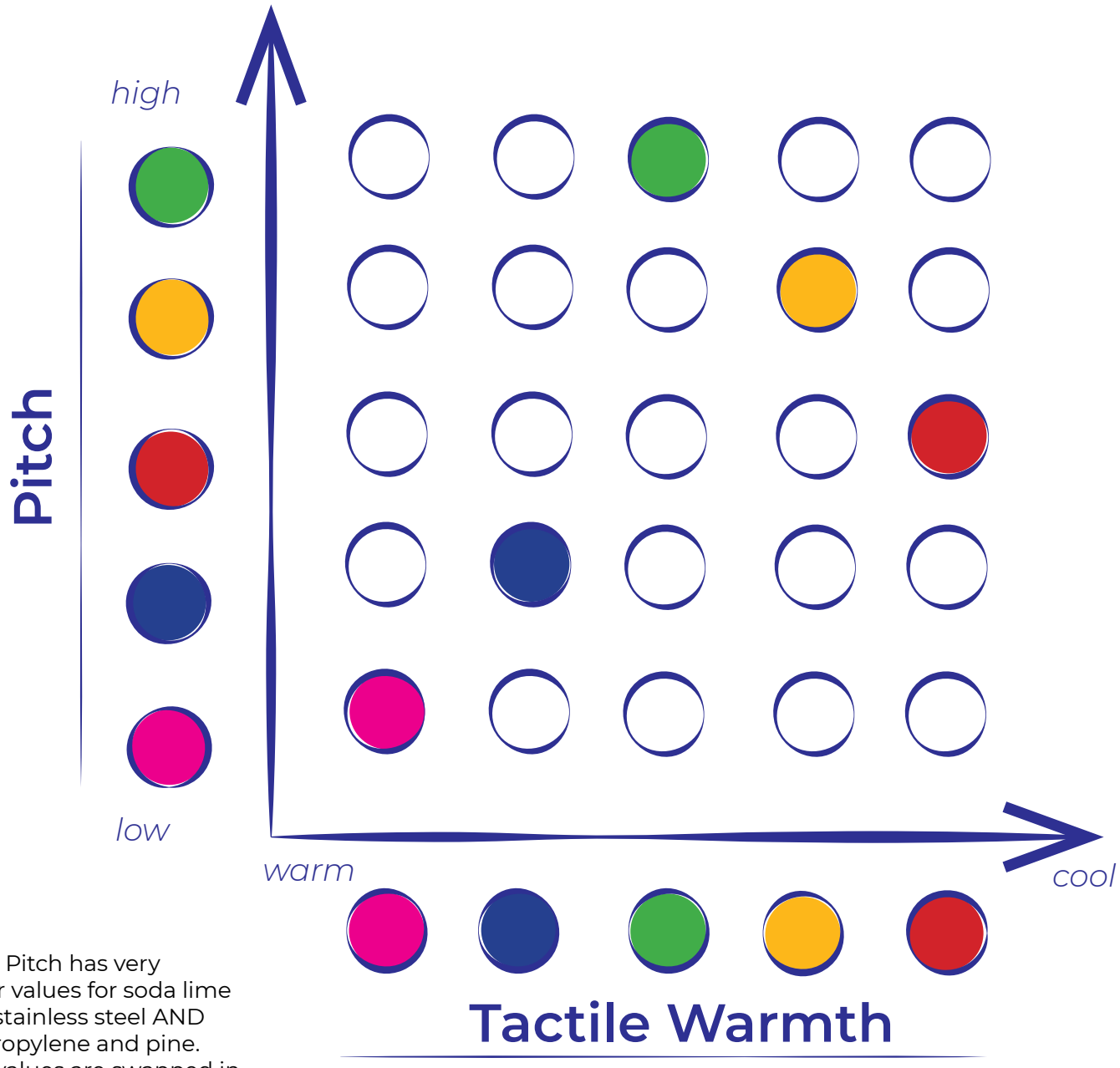
- Polypropylene

Pitch and Tactile Warmth



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