

TAP 228- 3: Materials database

Here are data for about a dozen properties of some 50 materials in Excel spreadsheet format. You can create lists ordered by property, search for materials with properties in certain ranges, etc. To compare pairs of properties, it is best to use the selection charts.

If you double click on the chart below it will open as an Excel spreadsheet that can be copied and used.

	Density / kg m ⁻³	The Young Modulus / GPa	Toughness / J m ⁻²	Elastic Limit / MPa	Energy Content / MJ kg ⁻¹
Cotton	1540	5	400	190	5.7
Leather	920	0.22	67000	3.2	14
Silk	1300	8.7	230	350	7.7
Wool	1300	4.5	440	89	7.7
Al Alloy	2700	77	9300	120	280
Austenitic Stainless Steel	7800	200	8900	410	100
Brass	8200	110	24000	190	110
Cast Iron	7400	130	3400	230	51
Copper	8935	130	32000	120	110
Gold	19300	78	46000	28	5800
High Alloy Steel	8300	240	2000	1600	66
Lead	11350	14	5400	6.9	40
Low Alloy Steel	7850	210	14000	740	71
Mg Alloy	1800	43	5000	170	400

Possible uses of the spreadsheet:

1. Simple reference source for materials data – e.g. to solve quantitative problems involving materials selection, e.g. perhaps calculate the necessary thickness for required thickness or strength of a cantilever.
2. Sort by property, e.g. which are the ten toughest materials in the database?
3. Search with logical operators, e.g. find all materials in the database stiffer than X, stronger than Y, less dense than Z. Try doing this by reading the information from a couple of charts.
4. Explore combinations of material properties not provided as selection charts – e.g. plot modulus against strength. Note that single 'typical' values are provided in the database rather than the full range, so this does give a true selection chart, but can identify interesting trends.
5. Design problems often lead to combinations of properties for which high or low values are required. A common example is 'specific stiffness' (the Young modulus divided by density), which gives an indication of materials which are light and stiff. Specific stiffness and strength are shown in one of the selection charts. Other compound properties for particular design problems could be calculated and plotted using the spreadsheet.

Also provided, below is a data that provides definitions of the materials in the database, and summarises their strengths and weaknesses in engineering design, typical applications and environmental notes. This is a useful reference source for materials. Not all will be needed.

Materials information

Double click on the icon below to access a materials database. This is an html document and will activate internet explorer. It has been virus checked.



040076f1.htm

Practical advice

This database has many potential uses e.g. comparison of experimental values.

Alternative approaches

Data books may be used to augment the information provided here. It has been deliberately provided in an open format.

Social and human context

The ability to search, sort and calculate adds value to raw data.

External References

This activity is taken from Advancing Physics Chapter 4, file 10D