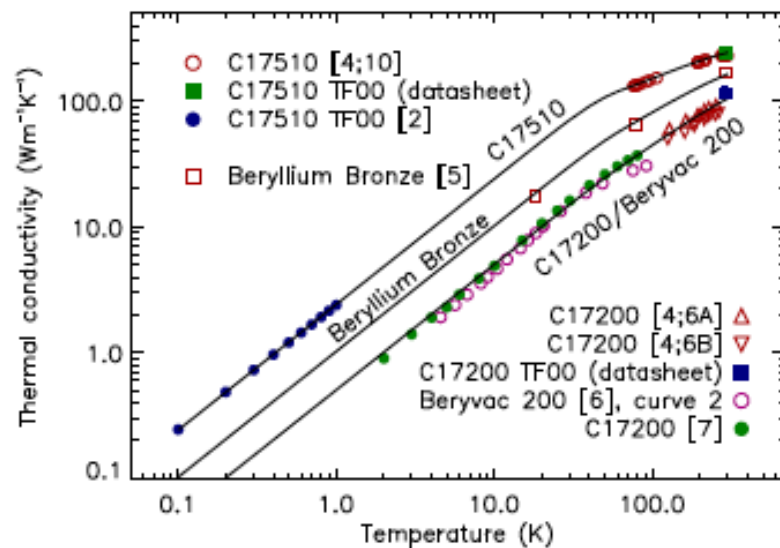


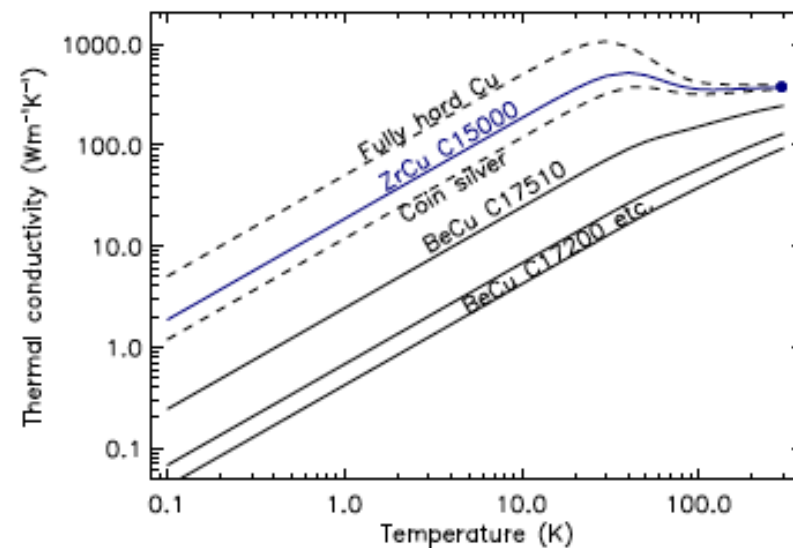
## Material Selection for the Masses and Wires(2)

2011/11/30 Chihiro Tokoku

- Beryllium Alloy (BeCu) ... health hazard
- Zirconium Alloy (ZrCu) ... C15000 (0.12-0.2% Zr) higher thermal conductivity than BeCu



**FIGURE 1.** Measured thermal conductivity values for various dilute copper alloys (datapoints), along with fits using the equations from Ref. [3] (lines). References are given in square brackets; numbers following a semicolon identify different samples from a given reference.



**FIGURE 2.** Recommended conductivity values for ZrCu and other coppers. Dashed lines are approximate.

with similar conductivity are also given in Fig. 2. The

# Properties at Cryogenic Environment

|                                   | Density<br>[E+3 kg/m <sup>3</sup> ] | Thermal<br>Conductivity<br>[W/m/K]  | Young's<br>Modulus<br>[GPa] | Specific<br>Heat<br>[J/kg/K]    | Resistivity<br>[ $\mu\Omega\text{m}$ ]<br>(RRR) | CTE<br>[E-6/K]                    | Machinability<br>(Brass=100) |
|-----------------------------------|-------------------------------------|-------------------------------------|-----------------------------|---------------------------------|-------------------------------------------------|-----------------------------------|------------------------------|
| Oxygen Free<br>Copper<br>(C10100) | 8.9                                 | ~2000@30K<br>~460@100K<br>~395@300K | 0.35@300K                   | 96@50K<br>255@100K<br>389@300K  | RRR>200-300                                     | 1.0@30K<br>10.7@100K<br>18.3@300K | 20                           |
| Beryllium<br>Copper<br>(C17500)   | 8.25                                | 130@300K                            |                             | 233@300K                        |                                                 | 17.5@300K                         | 40                           |
| Tellurium<br>Copper<br>(C14500)   | 8.94                                | 356@300K                            |                             | 385@300K                        | RRR~20                                          |                                   | 85                           |
| Zirconium<br>Copper<br>(C15000)   | 8.89                                | ~390@20K<br>~370@100K<br>370@300K   |                             | 394@293K                        | 0.00132@4.2K<br>0.0183@300K<br>RRR=13.8         |                                   | 20                           |
| Al6061-T6                         | 2.71                                | 71@60K<br>98@100K<br>159@300K       | 0.33@300K                   | ~10@20K<br>~80@100K<br>960@300K | ~0.02@20K<br>~0.04@300K<br>RRR=2.7              | 24@300K                           |                              |
| Ti6Al4V                           | 4.43                                | ~2@20K<br>~5@100K<br>~10@300K       | 0.342@300K                  | ~8@20K<br>~130@100K             | <0.01@5K<br>~2@20K<br>~2@300K                   | 8.8@300K                          | <10?                         |
| Silicon                           | 2.33                                | 2680@50K<br>884@100K<br>168@273K    | Anistropic.                 | 700@300K?                       |                                                 | 0.5@100K<br>1.5@200K<br>2.6@293K  |                              |

# Preparing of Lab 101

