Electronic Supplementary Material (ESI) for RSC Advances.


# Enhanced Temperature Stability and exceptionally high electrical Contrast of Selenium substituted $Ge_2Sb_2Te_5$ Phase Change Materials

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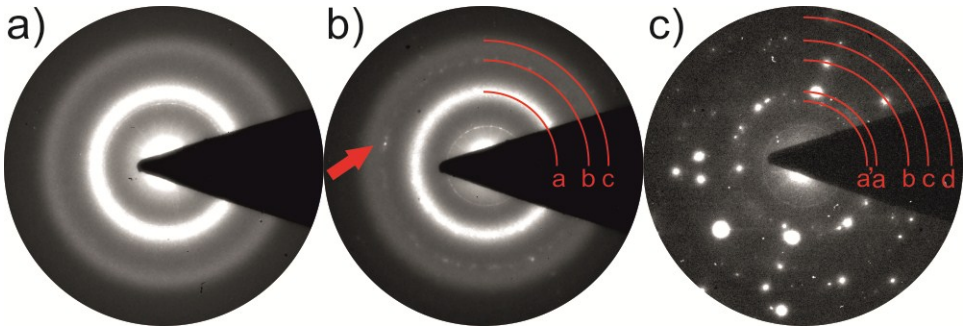


**Fig. S1 $Ge_2Sb_2Te_5$ ED: a) at room temperature; b) crystallization starts at 132 °C; c) electron diffraction at 150 °C. The red arrow marks first visible diffraction spots.**

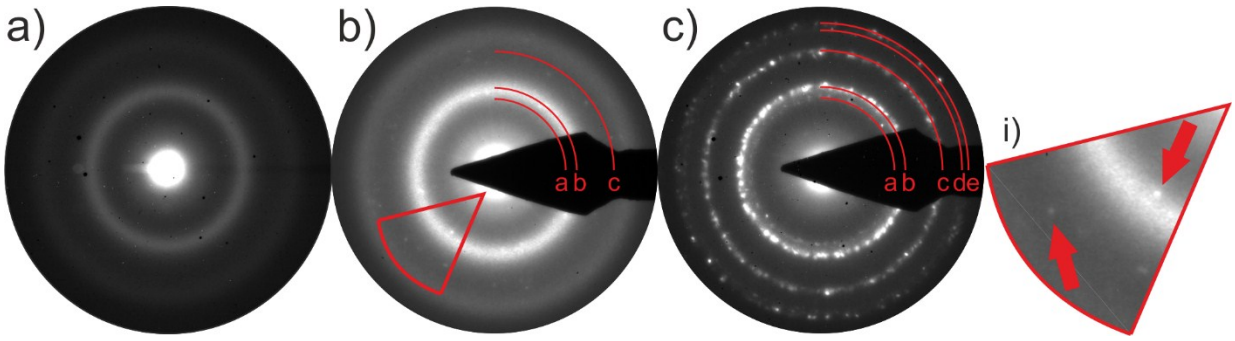


**Fig. S2 $Ge_2Sb_2Te_4Se$ ED: a) at room temperature; b) at 160 °C c) at 190 °C. The red arrow marks first visible diffraction spots. Further the red curves show the rotational average of the respective electron diffraction pattern.**

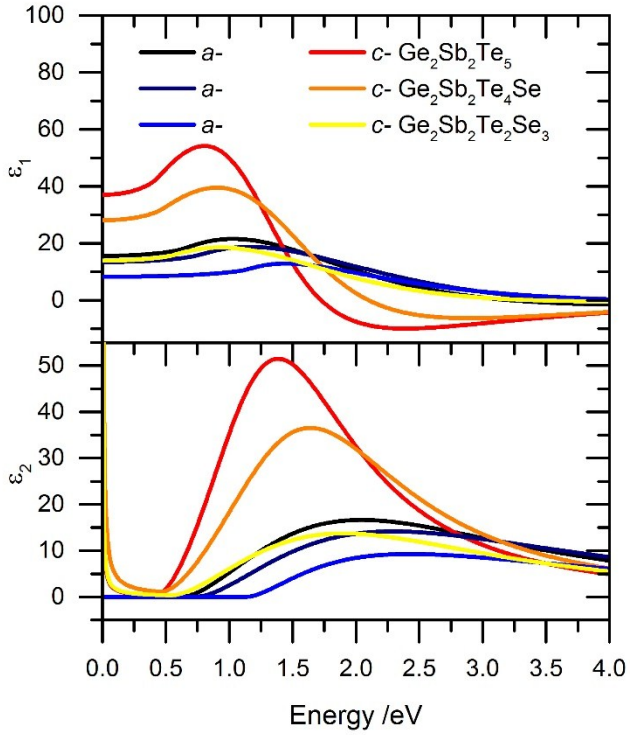


**Fig. S3 Functions of $\varepsilon_1$ and $\varepsilon_2$ including the Drude term.**

**Table S1 d-values of $Ge_2Sb_2Te_5$ according to the caption in Figure S1.**

| | d-value /Å | plane |
|---|---|---|
| ***a'*** | **3.57** | **(111)** |
| ***a*** | **2.96** | **(002)** |
| ***b*** | **2.11** | **(022)** |
| ***c*** | **1.75** | **(222)** |
| ***d*** | **1.51** | **(004)** |

**Table S2 d-values of $Ge_2Sb_2Te_4Se$ according to the caption in Figure S2.**

| | d-value /Å | plane |
|---|---|---|
| ***a*** | **3.43** | **(003)** |
| ***b*** | **3.05** | **(012)** |
| ***c*** | **2.14** | **(-114)** |
| ***d*** | **1.79** | **(006)** |
| ***e*** | **1.73** | **(-222)** |

**Table S3** **d-values of $Ge_2Sb_2Te_2Se_3$ according to the caption in Figure 3.**

| | d-value /Å | plane |
|---|---|---|
| *a'* | 3.44 | (003) |
| *a* | 3.01 | (012) |
| *b* | 2.09 | (-114) |
| *c* | 1.78 | (006) |
| *d* | 1.69 | (-222) |
| *e* | 1.48 | (024) |

**Table S4** **Rhombohedral setting.**

| rhombohedral setting | a / Å | α /° |
|---|---|---|
| $Ge_2Sb_2Te_4Se_1$ | 4.2404 | 59.34 |
| $Ge_2Sb_2Te_2Se_3$ | 4.2156 | 58.57 |