

## **Consolidation of GMS based composites via hot-pressing – SEM in-situ mechanical tests and electrical properties**

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Three types of powders were selected for processing of GMS (AIMR, Tohoku University) based composites. The powders of silver (Ag, Silverdust), copper (Cu, Warchem) and aluminium alloy (AlSi12, NewMet) were used to obtain GMS based composites. Planetary ball milling was used to prepare homogeneous powder mixtures. As a final product, three different composites with 10% by volume of GMS were obtained by hot pressing process (HP, Thermal Technology LLC). Sintered GMS-based composites were then mechanically tested by in-situ tensile tests under SEM observation (Zeiss Crossbeam 350 with Kamrath-Weiss tensile module). Figure 1 shows the material behaviour before and during loading.

Figure 1. SEM images of sintered GMS-based composites before and during loading. The images in the left column represent silver-based GMS composites, the middle column represents AlSi12 GMS composites and the right column represents Cu-based composites.

The measured tensile strength of the test composites is presented as follows (in brackets are presented values taken from literature for pure materials):

- Ag+10% vol. GMS = 62.1 MPa (170-200 MPa)
- AlSi12+10% by volume GMS = 160.4 MPa (>170 MPa)
- Cu+10% by volume GMS = 211.9 MPa (200-220 MPa)

The mechanical tests clearly show that only in copper does the addition of GMS have no negative effect on the mechanical properties. The resistivity measurement (Probestation.tw KSR-4 and Keithley DMM6500) shows that the Ag composite has the lowest resistivity, but the resistivity of Cu+GMS is still lower than that of pure copper, and in the overall view, this material was selected for further investigation (planned new materials with increased GMS addition up to 40%).