Evolution of the Connectivity of the Phases in a Short Fibre reinforced Al-piston Alloy during Creep

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The evolution of the microstructure during creep of an AlSi12CuMgNi alloy with 15 vol% of Al_2O_3 short fibres was investigated by means of synchrotron microtomography. The results reveal a change of the morphology of the hybrid reinforcement composed by the eutectic-Si, the short fibres and the intermetallic particles. This change takes place due to the diffusion induced coarsening of Si and a coarsening of the intermetallic particles. The interconnectivity of the hybrid reinforcement increases during long-term creep exposure reaching a degree of almost full interconnectivity after 6400 h of creep. The analysis of creep damage during secondary creep stage shows an increase of void volume fraction by a factor 2, while the number of voids per volume remains practically constant (void sizes larger than 8 voxels were analysed). An analysis of the voids' location indicates that pores generated during processing of the composite grow, but no new pores are produced during the primary and secondary creep stages.