THE INVESTIGATION OF PROPERTIES OF GLASS-CERAMIC FIBER COMPOSITE


*Department of Mechanical Engineering
The University of Sheffield
Sheffield, S1 3JD, United Kingdom
department of materials science and engineering
The University of Sheffield
Sheffield, S1 3JD, United Kingdom
Advanced Composites Centre for Innovation and Science (ACCIS)
The University of Bristol
Bristol BS8 1TR, United Kingdom

Key words: Glass-ceramic fiber, MAS glass-ceramic, LAS glass-ceramic, Fabrication fiber, Composite structures

Summary. Glass-ceramic is well-known material prepared by controlled crystallization of glasses, with variety of established applications. The great variety of glass-ceramic as matrices in composite systems that have been developed during the last 30 years shows their outstanding thermo-mechanical properties and high technological potential. However in the application of glass-ceramic fibre there are a few studies have been done due to the high melting temperature factor and small window of processing temperature. Among the recent developments to be considered which is included in this study is high-strength and low thermal expansion coefficient glass-ceramic; magnesium aluminium silicate glass-ceramic (MAS) and lithium aluminium silicate glass-ceramic (LAS). MAS glass-ceramic fiber was prepared using up drawing method and LAS glass-ceramic fiber formed using fiber tower equipment. Both glasses systems were annealed before been exposed to two-step heat treatments; nucleation stage and crystallisation stage in order to produce high strength glass-ceramic fiber. This work comprises an observational study on composites embedded with new
family of glass-ceramic fiber using various equipment to study different aspects in these materials. The results of the fiber fabrication using different methods, microstructural characterisation and properties shows the limits of applicability and the potential of both types of fibers for high temperature applications. Possible relationship within interface between fiber and matrix which directly correlated with the properties were briefly considered.

Figure 1. The heat treatment schedule for glass-ceramic fibres