Contribution ID: **461** Type: **Poster Presentation**

Numerical and Experimental Investigations of composite materials in cryogenic environment

Composite materials are being used extensively in different realms of science and technology for various applications. Testing of these composite materials is of substantial importance, as the composite materials might be susceptible to failure due to the variation in the operating temperature ranges and the cryogenic temperatures at which the material have to endure.
In the present work, the mechanical characterization of composite materials is investigated using double walled vacuum insulated chamber which is designed as an attachment to the Universal Testing Machine (UTM). The chamber with two walls separated by vacuum, is made up of SS316LN.The chamber is designed to accommodate a moving shaft of the lower part of UTM which applies tensile load on the specimen (composite) while the upper shaft connected to the chamber is fixed. One end of both shafts from the cryogenic chamber are fixed to the jaws of the UTM and has a chuck fitted on the other end to hold the specimen during the test. The chamber provide a cryogenic environment for the testing of the composite materials. The cryogenic temperature in the chamber is obtained by purging of LN2 into the chamber. A vacuum pump of capacity 10-3 mbar is used to create vacuum between the walls of the chamber to create an isolated environment. Two thermocouples are fitted in the chamber to collect data pertaining to temperature distribution. The high resolution camera installed inside the chamber gives an insight on how and when the fracture occurs. A numerical simulation is done using a commercial software ABAQUS to predict the stress concentration zones in the composite material. Further, crack analysis is also done using extended finite element method (XFEM). The results show that cryogenic temperatures significantly influence the mechanical behaviour of composite materials.

Primary author: Mr SUNIL, Karthik (School of mechanical engineering)

Co-authors: Mr SINGH, Charanjit (school of mechanical engineering); Mr RAVULA, Jeswanth (School of mechanical engineering); Mr CHEMIKALA, Prudhvinath Reddy (School of mechanical engineering); Mr DONDAPATI, Rajasekhar (School of mechanical engineering); Mr SINGH, Sandeep (school of mechanical engineering)

Presenter: Mr SUNIL, Karthik (School of mechanical engineering)

Track Classification: ICMC-14 - Cryogenic Materials Testing and Methods