ABSTRACTS

Bonded joints show a complex stress field, with large strain gradients, difficult to acquire experimentally, which would be very useful to validate numerical models; normally DIC is used for it. Two experimental techniques are proposed at this paper, and their feasibility and performances are compared. The properties of CNT doped adhesive films are well known for uniform strain field; by plotting conductive patterns on the adhesive film, the responses at the high and low shear strain regions are obtained, giving a much better insight on the changes in electrical conductivity under complex strain field.

An optical fibre embedded into the adhesive film, aligned to the loads, experience the strong strain gradients that are predicted by the models. Experimental results are compared to the numerical predictions given by Volkorsen model. The double lap joint is selected to avoid the bending moments caused by load misalignments, with strong out-of-plane displacements that frequently mask strains caused by the pure shear loads. With the double lap, the symmetry of loads simplify the response, only the shear stresses are present, with a minor component of peeling stresses at the discontinuities, Strain measurements were done at several load levels and at two different temperatures, to validate the temperature compensation algorithms.

Partial damage are then be inflicted at the adhesive joint, and the ability of the two techniques to detect early damages is quantified. It has been reported previously that partial damages cause very slight changes at the strain field, and consequently they would be undetected by an strain measurement technique. Nevertheless, we have found experimental evidence of changes in the electrical response in case of partial debonding, and even in case of improperly treated surfaces. More tests are on progress, and results will be reported.

KEYWORDS

Bonded joints | Fiber optic | Nanocomposites | Strain Sensing | SHM |