

## **Modelling of induced thermal stresses during induction welding of thermoplastic composites**

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Carbon Fibre PEEK is a thermoplastic composite material. One of the advantages of CF-PEEK and thermoplastics in general is their ability to be joined via welding. During the welding process many researchers have observed that defects such as deconsolidation, delamination, porosity and micro-buckling may occur[1]. This has been attributed to several factors including residual stress. Research showed that laminates subjected to uniform heating did not experience deconsolidation and concluded that thermal stress induced by nonuniform temperature fields in the welding process were responsible for deconsolidation. In the current work the residual stress in CF-PEEK sample is modelled. First the stress induced during the manufacturing process is modelled to capture the residual thermal stress in the part. Then a local heat source representing the heat required to weld the part is applied. The influence of this local heating on the thermal stress gradients is then presented. Finally, the influence of preheating the area surrounding the local heat source on the thermal stress gradients is modelled and discussed.

### **References**

1. Xiao, X. *A model for the deconsolidation phenomenon in induction heating of thermoplastic resin composites.* in *Proceedings of the 9th International Conference on Composite Materials [ICCM9]*. 1993.