Thermo-mechanical analysis of laminated composites exposed to fire. Application to the analysis of ship structures.

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ABSTRACT

In this paper is presented a numerical model for the thermo-mechanical analysis of laminated composite structures under the fire action. The coupling between the thermal and mechanical behaviour is considered in weak form (temperatures field modify mechanical properties but displacements field do not modify thermal properties). The thermal part of model is based on the approach presented in Henderson et al. [1]. This model takes into account the energy transfer processes of heat conduction, pyrolysis of the polymer matrix, and diffusion of decomposition gases. The mechanical behaviour of the composites is based on the serial/parallel mixing theory [2] which is modified to take into account the thermal degradation of the mechanical properties. Numerical results obtained with this model are compared with some experimental tests presented in the literature. Application of the developed model to the analysis of fire scenarios in composite ships is evaluated.

REFERENCES

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