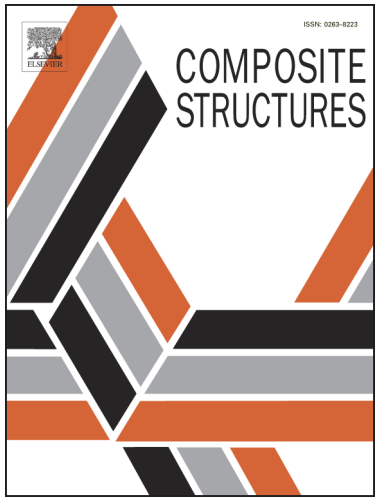


# On hypotheses of composite laminated plates based on new modified couple stress theory

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# On hypotheses of composite laminated plates based on new modified couple stress theory

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**Abstract:** A series of assumptions of new modified couple stress theory have been used in models of composite laminated micro-plates to simplify formulas in engineering mechanics. These models can be viewed as simplified models. In this paper, a new model without any simplification is developed as standard model to compare various simplified models. It is worth note that the fundamental hypotheses introduced in couple stress theory, but not kinematic assumptions of classical plate theory, are discussed as the main points in this article. The scope of application of these hypotheses has been given in this paper. The numerical results shown that the hypotheses of $\omega_z=0$ can be used for Kirchhoff and Mindlin theories. For Reddy theory, the hypothesis $\omega_z=0$ can also be introduced to simplify formulas. However, the hypothesis of curvatures $\chi_{xz}=0$ and $\chi_{yz}=0$ can be used when the span-to-thickness ratio is no less than 8, while it brings a relatively big error with a small span-to-thickness ratio, such as L/h=4. In addition, three models can capture the scale effects and the error of three simplified models is gradually rising by increasing the material constant.

**Key word:** composite laminated plates; new modified couple stress theory; material length scale parameter; hypotheses; scale effect

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