



# Effect of variable volume fraction distribution and geometrical parameters on the bending behavior of sandwich plates with FG isotropic face sheets

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## ABSTRACT

This article analyzes the bending behavior of functionally graded sandwich plate structures submitted to sinusoidal loads using the hyperbolic quasi-3D shear deformation plate theory. In this theory, the number of unknowns is reduced from six to only five unknowns using an undefined integral without needing any shear correction factor. Furthermore, the effective constituent material properties of the upper and lower layers of the functionally graded sandwich plate are assumed to vary smoothly and continuously only in the thickness direction. In contrast, the core layer is still homogeneous and isotropic. The governing equilibrium equations of simply supported functionally graded sandwich plates are derived using the principle of virtual displacement. Their analytical solution is obtained using Navier's technique for various schemas of functionally graded sandwich plates. The effects of the power law index, side-to-thickness ratio, and aspect ratio on the bending behavior are investigated.

## ARTICLE HISTORY

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## KEYWORDS

Bending behavior; FG sandwich plate structures; sinusoidal loads; undefined integral; Navier's technique

## 1. Introduction

Japanese materials scientists initially proposed for the first time a new philosophy of intelligent materials capable of withstanding very high-temperature gradients Koizumi (1997). Such inhomogeneous materials [functionally graded material (FGMs)] have attracted many researchers as new gradual and continuous changes in the composition of materials for a super-high-temperature environment.

Sandwich plates have been widely used to construct components such as aerospace, automobile, civil, and many other engineering applications. Sandwich plates are made chiefly from three layers, and the two face sheets are adhesively bonded to the core. These compositions make lightweight structures with higher strength-to-weight ratios and ease of manufacturing. The major