Impact damage behavior of basalt fibers composite laminates: comparison between thermoplastic and thermosetting matrix

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Abstract

Recently, the growing attraction to the development of new eco-sustainable composite materials is driving the research interest toward the replacement of synthetic reinforcing fibers with natural ones and to exploit the intrinsic recyclability of thermoplastic resins even for uses in which thermosetting matrices are well consolidated (eg naval and aeronautical fields). Among the natural fibers a growing interest of the research, especially on the academic side for now, is addressed to basalt fibers [1], Basalt fibers, based on volcanic rocks originated from frozen lava, show chemical composition similar to glass fibers but offer better strength and higher elastic modulus characteristics [2]. Moreover, if compared to carbon or Kevlar fibers, basalt ones have wider application temperature range and higher impact performances to be potentially used in a broad range of industrial applications [3]. Focusing the attention on thermoplastic composites, many experimental findings already available in the literature highlight the outstanding mechanical properties of composite materials including natural basalt fibers and the potentiality of this latter with respect to glass fibers [4].

In this work, symmetric basalt (BS) fabric plaques $[(0/90)_9]s$ based on a neat polyamide 6 (PA6) films, polypropylene (PP) and vinylester (VE) resins with the same thickness were investigated to compare their dynamic response. Impact tests were carried out at penetration and at different energy levels to study the influence of the matrix on the damage start and propagation. A general better behavior of BS_VE plates was noted while, surprisingly, the BS_PPC ones didn't show any penetration even at high impact energy highlighting the importance of this study. These data, still under investigation, will be complemented by morphological and non-destructive inspections to gain useful information about the involved damage mechanisms.

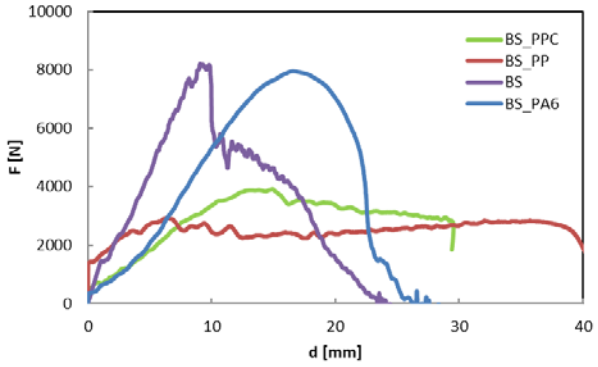

Figure 1. Load displacement curves at penetration

References

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