

Multiple responses optimisation in injection moulding parameter for polypropylene-nanoclay-gigantochloa scortechinii via Taguchi method

ABSTRACT

This paper presents the findings of multiple responses optimisation of overall quality performances for the samples made from the blend of polypropylene-nanoclay with different weight percentage of Gigantochloa Scortechinii fibres. The contents of fiber were set at 0 wt. %, 3 wt. % and 6 wt. %. The selected injection moulding parameters were packing pressure, melt temperature, screw speed and filling time. The overall quality performances that need to be improved upon the optimisation were flexural strength, warpage and shrinkage. This research started by drying the fibres at 120°C before mixing the fibres with polypropylene, compatibilizer (polypropylene grafted maleic anhydride) and nanoclay. The compounding of these nanocomposites was performed before injection moulding by using lab compounder and palletizer. The multiple responses optimisation process was compiled by adding the signal to noise ratio for each responses. As for the results, for control sample (0 wt. % fibre) the validated S/NQP was 112.173 dBi by using the optimised parameter. These values were used for comparison purposed. As for the 3 wt. % of fibre content, the validated S/NQP was 133.313 dBi at 35% of packing pressure with 170°C setting of melt temperature. The filled time was 3 seconds with 35% of screw speed. As for the 6 wt. % setting, the validated S/NQP was 135.835 dBi with the same setting of packing pressure and screw speed but with different setting of melt temperature (175°C) and filled time (2 seconds). The most influential parameter for control sample was melt temperature but the parameter changed to packing pressure when the fibre was added. Therefore existence of fibre was proven to affect towards the end results. In conclusion, the optimum values of parameter setting and fibre content will improve the quality performances specifically for products samples made from polypropylene-nanoclayGigantochloa Scortechinii. This material obviously giving a promising manufacturing opportunity to improve the quality of the injected moulding products.