Effects of reinforcing elements on the performance of laser transmission welding process in polymer composites: a systematic review

ABSTRACT

The laser transmission welding was initially introduced to join thermoplastic sheet film and moulded objects. However, presently this welding technique has been brought to the industrial applications to join polymer composites. Unlike polymer-polymer laser transmission welding, optical and thermal properties of reinforcing elements greatly influence the laser transmission welding process of polymer composites. It is dedicated for all reported works that glass fiber causes scattering in composites which reduces the laser intensity of transparent material and thus, glass fiber is not suitable for absorbing laser rather it needs additive such as carbon black to improve laser absorption. Moreover, it is demonstrated here based upon systematic reviewing of laser transmission welding that carbon fiber and carbon nanotubes have very good laser absorption capacities, but not suitable for transparent parts. Moreover, natural fibers are found to inherit some limitations for laser transmission welding including the low processing temperature, prone to chemical reaction due to organic material and laser interaction. Besides, various welding methods are categorized and discussed here.

Keyword: Laser transmission welding; Natural fibers; Carbon nanotubes; Carbon fiber; Glass fibers