

“Hybrid Staple Fibre Nonwoven Process for the Production of Organo Sheets”

„Hybrid-Stapelfaser-Vliesstoffprozess für die Herstellung von Organoblechen“

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Abstract:

Goal of this work is the development of a nonwoven based process for the production of a staple fibre structure reinforced organo-sheet. This material is designed to be applied in surface applications and to take up secondary loads. By applying recycled carbon fibres, a high fibre yield and additional functions like heat development, a cost efficient process is developed.

Approach:

The high yield of applied recycled carbon fibres is achieved by a combination of an airlay and a wetlaid process. The resulting hybrid structure is subsequently analysed regarding mechanical performance, profitability and heat generation in comparison to a benchmark material.

Results:

It is shown that the hybrid staple fibre structure reinforcement for organo-sheets is up to 38 % stronger than the benchmark material. The production costs could be reduced by 28 %. A surface temperature of up to 81.5 °C was achieved with a specific energy requirement of 15.6 kWh/m².

Buzzwords: Carbon Fibre, Recycling, Nonwoven, Hybrid Structure, Heat Generation

Kurzfassung:

Ziel der Arbeit ist die Entwicklung eines vliesbasierten Prozesses für die Produktion eines stapelfaserstrukturverstärkten Organoblechs. Dieses Material ist für den Einsatz in Sichtanwendungen sowie zur Aufnahme von Sekundärlasten vorgesehen. Durch den Einsatz rezyklierter Carbonfasern, eine hohe Faserausbeute sowie zusätzlicher Funktionen wie Wärmeerzeugung wird ein kosteneffizienter Prozess entwickelt.

Lösungsweg:

Die hohe Ausbeute rezyklierter Carbonfasern wird durch Kombination eines Airlay- und eines Wetlaidprozesses erreicht. Die resultierende Struktur wird anschließend hinsichtlich mechanischer Eigenschaften, Wirtschaftlichkeit und Erwärmungsleistung im Vergleich zu einem Benchmark-Material untersucht.

Zentrale Ergebnisse:

Es wird gezeigt, dass die hybride Stapelfaserverstärkungsstruktur für Organobleche 38 % fester als das Benchmark-Material ist. Die Produktionskosten wurden um 28 % reduziert. Es wurde eine Oberflächentemperatur von bis zu 81,5 °C bei einem spezifischen Energieverbrauch von 15,6 kWh/m² erzielt.

Schlagwörter: Carbonfaser, Recycling, Vlies, Hybridstruktur, Wärmeerzeugung

Parts of this work are based on the results of project-, bachelor-, master- and diploma-theses. These theses were issued by me on basis of the progress of this work and have been conducted under my direction. A complete bibliographic list of these works is attached at the end of the bibliography. All results are cited with the appropriate reference for the convenience of the reader.

Dedicated to my family.

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