

“We showed that reclaimed fibres can be used in various applications with (recycled) polymers and bioplastics.”

Introduction

The reasons for recycling plastics and textile waste are similar or even the same. The costs for raw materials and waste disposal are steadily rising. Reclaimed materials add an ecological benefit and are generally of lower cost. However, a major problem when using recycled polymers are the aesthetic properties of product surfaces. Because of using many grades, additives and colour pigments in polymeric applications, the colour of mixed recycled materials cannot be controlled. Moreover, despite of purification techniques unevenness can occur due to small contaminations such as sand particles.

Textile waste is generally broken into fibres by shredding and milling. Dependent on the type of textile separation technique and processing cycles reclaimed fibres can contain short fibres, threads as well as fabric pieces.

Moreover, to reduce the dependence and consumption of petrochemical feedstock in the first place a great interest exists in biobased and biodegradable consumer products, particularly as packaging films and containers.

Approach

The main objective of this study was to develop polymeric products with appealing surface properties using recycled textiles made of polyester and cotton fibres.



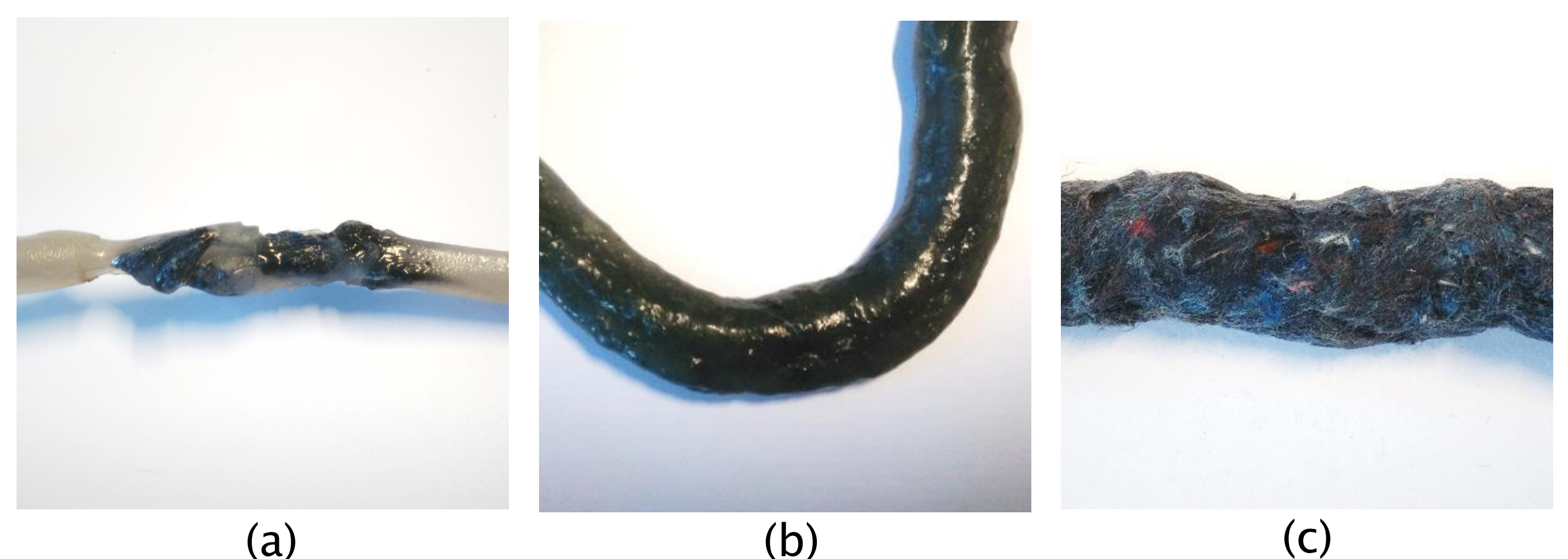
Various experiments were conducted using mixing, extrusion and compression moulding. Composites were prepared with a petrochemical polymer, wall paper paste and starch based bioplastics as matrix material.

To facilitate mixing and application reclaimed fibres were also shortened to lengths of 4 and 8 mm using a fibre cutting mill. Short fibres were used as additive during extrusion, for compounding or added externally after extrusion.

Results

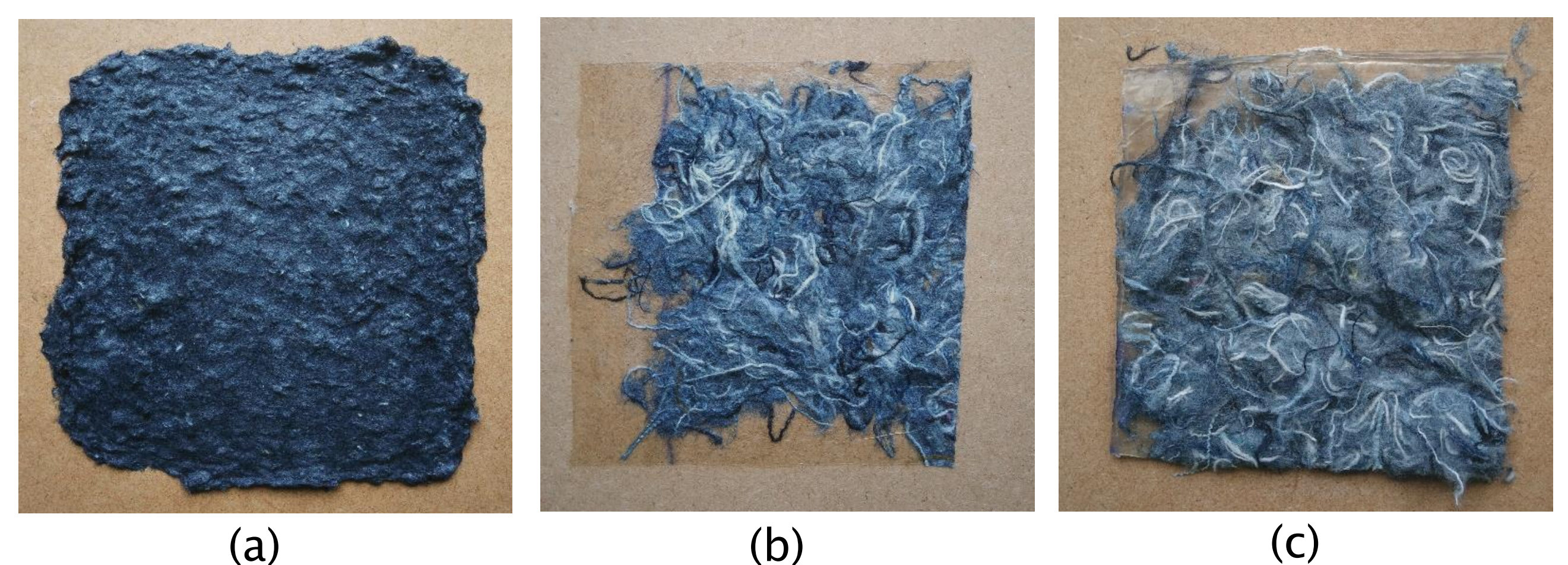
This study showed that plastics with interesting and appealing surface texture can be produced using recycled fibres in combination with conventional processes such as extrusion and compression moulding.

Extrusion is no recommended process for fibres longer than 10 mm. Due to their length fibres entangle during mixing, especially inside an extruder screw, and obstruct the polymer flow. Moreover, the fibre lightweight impedes mixing with polymer granules in a hopper. However, small fractions of milled fibres can be used to dye polymer. In order to increase the fibre fraction in extrudate, compounds can be produced, also by compression moulding, and thereafter be extruded. It was shown that fibre mass fractions of up to 50% can be extruded, which exhibit a fibrous haptic similar to felt. Furthermore flock and felt can be applied externally on extrudate to change the texture of polymeric surfaces.



Fibre cluster in PP extrudate (a), PP dyed by milled fibres (b) and extrudate made of fibre filled compound

Reducing the length of recycled cotton fibres facilitates mixing but also the application as wall covering. Thin coverings similar to plaster can be realised, which allow for low amounts of wall paper paste, shorter drying periods and the use of sprayers. Furthermore, wall coverings with a backing made of wall paper paste can be produced using calendering. Tiles made of recycled fibres with a petrochemical polymer and bioplastic backing can be additionally manufactured using compression moulding. The developed materials can be produced with a hard or soft finish, and are suitable as wall panels on flat and curved structures.



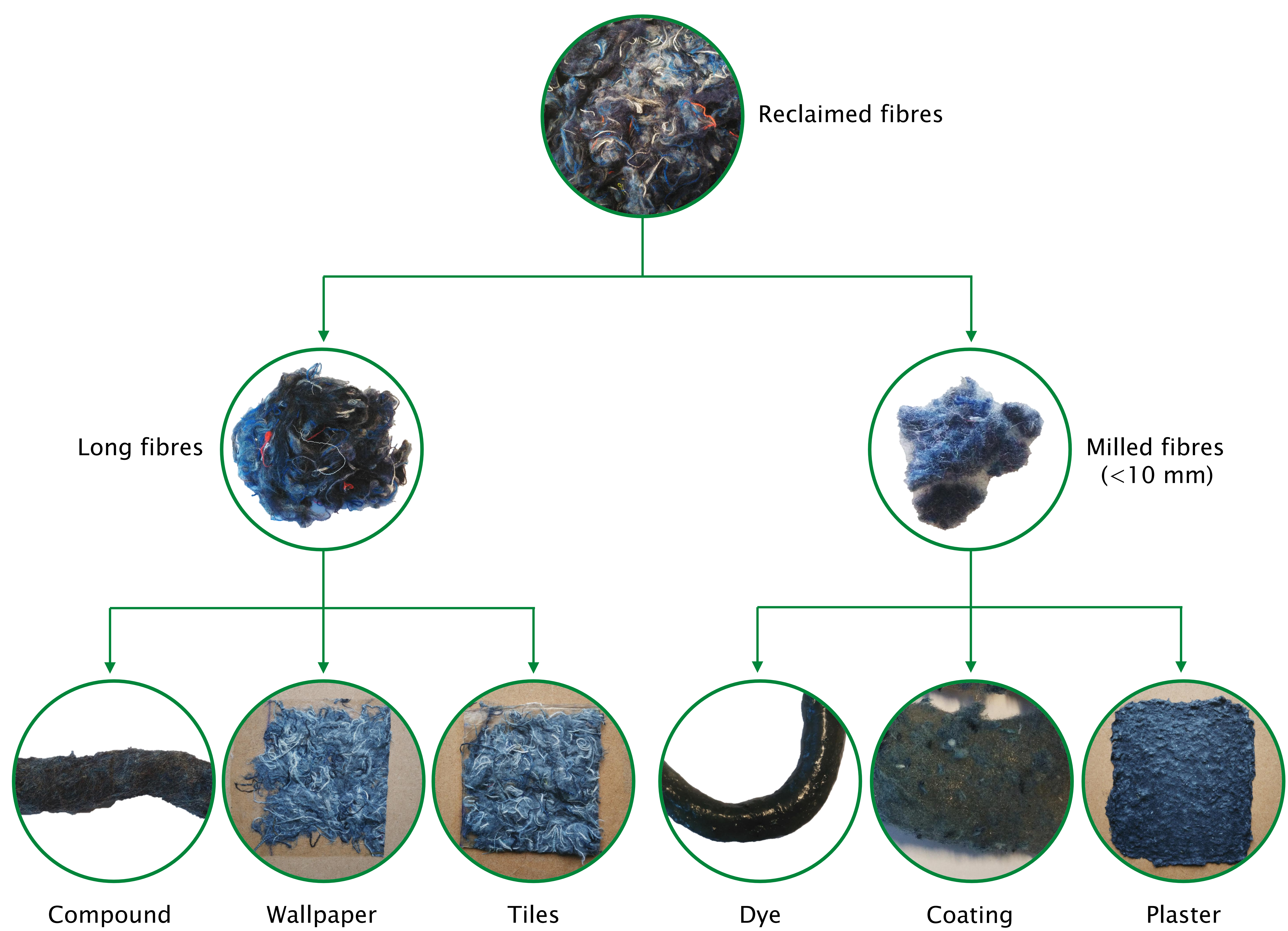
Plaster made of wall paper paste and milled fibres (a), wall paper (b) and tile (c) made of recycled fibres

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Decoration made of recyclates

Approach



Recycling

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