# EFFECT OF CHEMICAL TREATMENT AND STORAGE ON GLASS FIBER QUALITY



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### Introduction

- Wind energy, one of the biggest sources of renewable energy production, can have environmental impact following End-of-Life issues of glass fibre composite waste of wind turbine blades.
- **Recovering glass fibres** from blades through **solvolysis** with **organic solvents** (e.g. alcohols and acetones)
- Solvolysis of the samples were performed in sealed **high-pressure vessels**.

#### Flow diagram of solvolysis

#### Motivation

- To study the impact of environment on chemically recycled glass fibers over the time.
- To study the impact of sizing removal (outer coating) on the properties of glass fibers.





Storage

## Solvolysis

Single fiber testing was performed to study the mechanical properties of glass fibers. Comparison was made between virgin and recycled fibers to check the strength loss of recycled fibers.



#### **Design Concept**

The study focuses primarily on virgin fibers, allowing comparisons to be drawn with chemically treated glass fibers. Virgin fibers undergo a gentle low temperature desizing process in acetone to avoid fiber damage that could be induced by the high pressures and temperatures of the chemical recycling process. Fibers will be stored in desiccator (0% humidity) and environment chamber (50% humidity) for 8 weeks.





Mechanical properties of virgin glass fibers and recycled glass fibers.

Fiber reinforced composite sample (a) was used in solvolysis. The depolymerized fibers (b) were removed from the reactor and subsequently cleaned using acetone. The oil product (c) obtained from the solvolysis process was also collected.





Electron Scanning Microscope (SEM) image is investigate the to used surface of virgin glass fibers which looks (figure a) and surface of smooth desized glass fiber (figure b) which looks rough. Figure b shows that acetone has some effect on the surface of desized glass fibers.

Weight analysis of sizing on the virgin and desized glass fibers by Thermogravimetric analysis (TGA).

The TGA analysis was conducted to examine the removal of sizing. It was observed that around 4% weight loss occurred, indicating the removal of an organic coating from the surface of the virgin glass fibers. Following the chemical treatment, there was almost no wait loss occurred which indicates removal of sizing.



Fiber reinforced composites sample (a), depolymerized glass fibers (b), and oil product (c).

org University artment of Physics Nanotechnology	EHT = 10.00 kV WD = 11.5 mm	System Vacuum = 1.05e-005 mbar Pirani Pressure = 3.22e-003 mbar	Mag = 6.9 2 µm	92 K X	Signal A = SE1 Date :1 Dec 2022		Aalborg University Department of Physics and Nanotechnology	EHT = 10.00 WD = 11.5 r

University	EHT = 10.00 kV	System Vacuum = 9.52e-006 mbar	Mag =	6.92 K X	Signal A = SE1	
ent of Physics technology	WD = 11.5 mm	Pirani Pressure = 3.20e-003 mbar	2 µm		Date :1 Dec 2022	

SEM image of (a) virgin glass fiber and (b) desized glass fiber

## **Future scope**

A comparative investigation will be undertaken to assess the influence of humidity on virgin fibers, and solvolysis recovered fibers. This study aims to analyze the changes in properties exhibited by glass fibers over a period of time. Furthermore, this study aims to gather insights into the damage incurred by fibers due to the recycling process.

Wind blades-Fiber

reinforced composite

Recycling

and storage

of glass

fibers

Chemical Recycling



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