**Introduction**

Environmental issues are becoming increasingly important to industry and governments, which has led to the promotion of natural fibres. This has led to a focus on basalt fibres which demonstrate superior mechanical properties compared to vegetal fibres and compare, or are higher, to those of glass fibre [1]. In recent years, particular attention has been paid to thermoplastic matrices due to their low cost, good mechanical properties and recyclability [2]. In order to achieve efficient reinforcement of thermoplastics, adhesion between basalt fibre and the thermoplastic matrix needs to be improved. This can be achieved through surface modification of the fibre through chemical or plasma treatment or, through modification of the matrix [3,4]. Sizing is a fundamental stage in the process of fibre manufacture and acts as protector for fibre during processing as well as a coupling agent, typically using silanes, to promote adhesion between fibre/matrix [5]. It remains one of the most cost effective and beneficial modifications methods for fibre manufacturers. The aim of this work is to study the influence of sizing has on the mechanical properties and adhesion of short basalt fibre reinforced polypropylene.

**Surface**

**AFM Fibre Surface**

- PPs1 shows smooth and continuous surface
- PPs2-4 significantly increased surface roughness
- Reduction in polar component of PPs2-4 sized samples = increased compatibility with PP

**Interface**

**AFM Fibre-Matrix Interface**

**SFFT - IFFS**

- PPs1 samples. Some minor cracking on PPs3-4 and no cracking for PPs2
- Sizing clearly shows a significant influence on Interfacial Shear Strength. PPs1 reduces IFFS by ~3% compared to non-sized fibre while PPs2 increases IFFS by 117.6%
- Adhesion properties of PPs2-4 greater than sized glass fibres (6.7-5MPa), PPs2 greater improvement than bulk modification of polymer with PP-g MA and comparable to IFFS between carbon and epoxy.
- Good adhesion further confirmed for PPs2-4 by polymer reduced fibre pull-out and increased polymer residue on fibres from fractured surface SEM
- Adhesion increase attributed to increased chemical bonding.

**Composite**

**Overview**

- Short basalt fibres can significantly increase tensile strength and modulus by up to 64% and 112% respectively
- Modulus is independent of fibre sizing
- Sizing has a significant effect on both tensile and impact properties
- High levels of adhesion result in higher strength and brittle nature
- Low adhesion results in higher impact properties

**References**