

## PRODUCT APPLICATION NOTE

# Impact Modification in Polycarbonates & Polyester

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### Introduction

Plus product, OPTIM®GB-345 is a modified ethylene butyl acrylate copolymer (EBA) grafted with glycidyl methacrylate (GMA) while OPTIM®GE-344 is a glycidyl methacrylate modified ultra-low-density polyethylene (Polyolefin elastomer i.e. POE). This series has the potential to improve the impact strength of engineering polymers, especially polycarbonates, polyesters, and their alloys.

### GMA grafted Copolymers:

These copolymers combine the properties of glycidyl methacrylate (GMA) and ethylene-butyl acrylate (EBA) or polyolefin elastomer.

GMA provides reactivity due to its epoxide functional group, allowing it to react with other functional groups. EBA or POE contributes flexibility, softness, and polarity to the copolymer.

Glycidyl methacrylate-based coupling agents can react with the hydroxyl and carboxyl end-groups of polyester.

### Applications in Polycarbonate (PC) and polyester:

**Impact Modification:** GMA grafted copolymers make covalent bonding with functional groups of polymers (PC or polyester) while its elastomeric backbone provides enhancement in impact strength. GMA grafted copolymers can be used as impact modifiers for PC & polyester. They enhance the material's toughness and impact resistance.

**Compatibilization:** Blending two or more polymers creates a multitude of opportunities for the creation of unique materials with intriguing characteristics. However, because polymers are incompatible; immiscibility usually leads to the loss of mechanical characteristics. The fundamental cause of immiscible blends is their poor interfacial adhesion. Thus, a polar reactive compound works as compatibilizer to enhance the interfacial adhesion between two polymer phases.

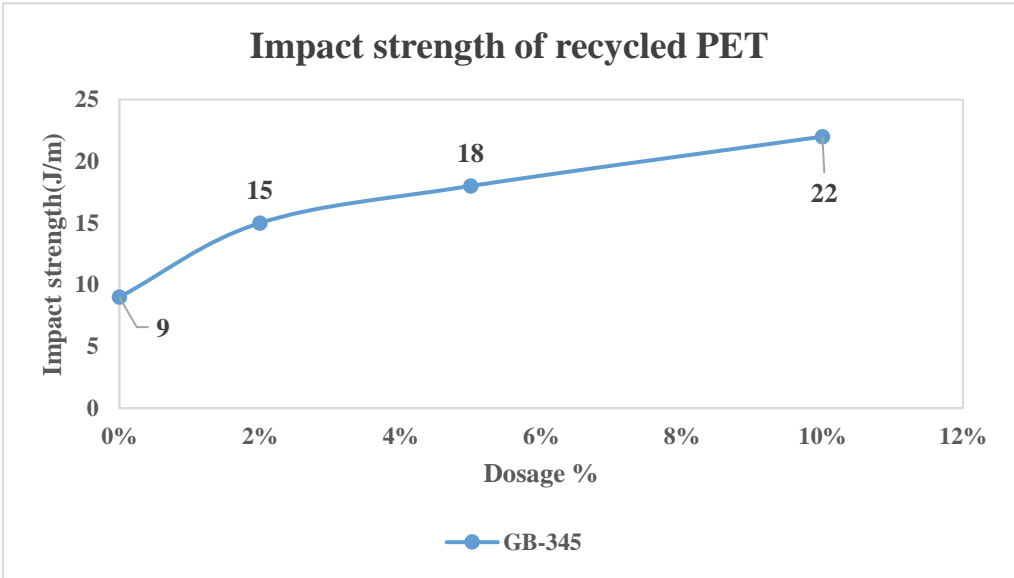
When PC is blended with other polymers (such as polyesters or polyolefins), GMA grafted copolymers acts as a compatibilizer. It improves the compatibility between different polymer phases, leading to better mechanical properties.

Polar functional groups in OPTIM®GB-345 & OPTIM®GE-344 help in better dispersion and compatibilization of mineral fillers and reinforcements in the polymeric compounds.

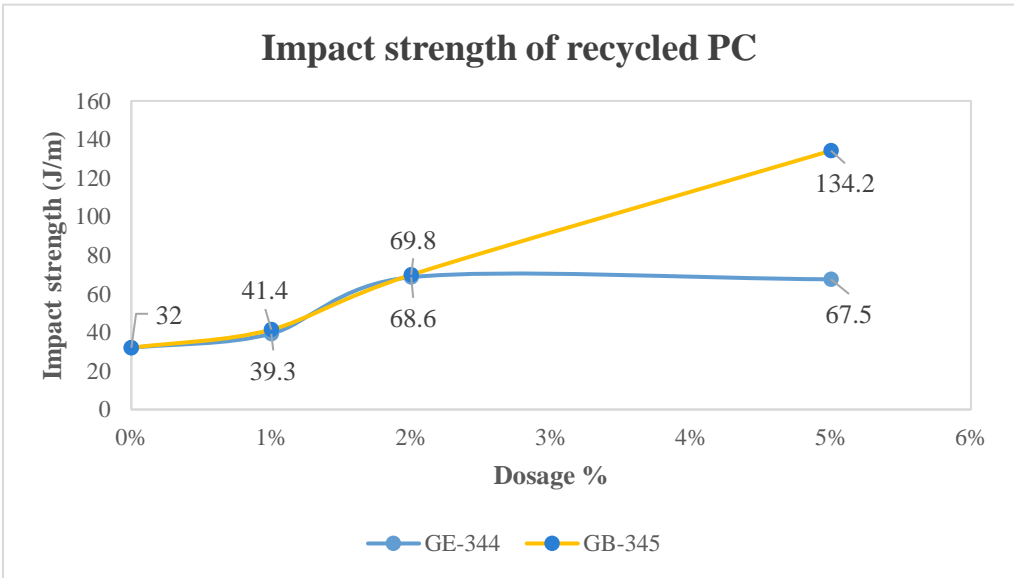
**Recycling and Upcycling:** When polycarbonates are recycled, drop in impact strength becomes an issue for applications. To compensate for the gap in impact strength of filled or unfilled PC for injection moulding or extrusion of components, it is necessary to blend it with suitable impact modifier through compounding. GMA grafted copolymers can also play a role in recycling and upcycling processes by improving the properties of recycled PC. Both functionalized polymers can also be used to modify recycled PBT or PET.

### Case study

We have taken the trial OPTIM®GB-345 in recycled PET, data are shown below:



We have taken the trial of OPTIM® GB-345 and OPTIM® GE-344 in recycled PC, data are shown below:



### Dosage

Dosage of OPTIM<sup>®</sup> GB-345 and OPTIM<sup>®</sup> GE-344 in the PC compound varies from 2-5 % depending upon impact requirement.

Dosage of OPTIM<sup>®</sup> GB-345 and OPTIM<sup>®</sup> GE-344 in the Polyester compound varies from 2-10 % depending upon impact requirement.

- Dry the recycled polymer in the hopper drier at 120°C for 2-3 hr.

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**Disclaimer:**

The information given here is meant as a guide to determining suitability of our products for the stated applications. It is based on trials carried out by our laboratories and data selected from literature and shall in no event be held to constitute or imply any warranty. The products are intended for use in industrial applications. The users should test the materials before use and satisfy themselves with regard to contents and suitability in the desired application. Our formal specifications define the limits of our commitment. Recommendation herein may not be construed as freedom to infringe/operate under any third-party patents. In the event of a proven claim, our liability is limited only to replacement of our material and in no case shall we be liable for special, incidental or consequential damages arising out of usage of our material. This datasheet is subject to change without not.