

# MECHANICAL RECYCLING

## Basic requirements for a two-stage injection molding process

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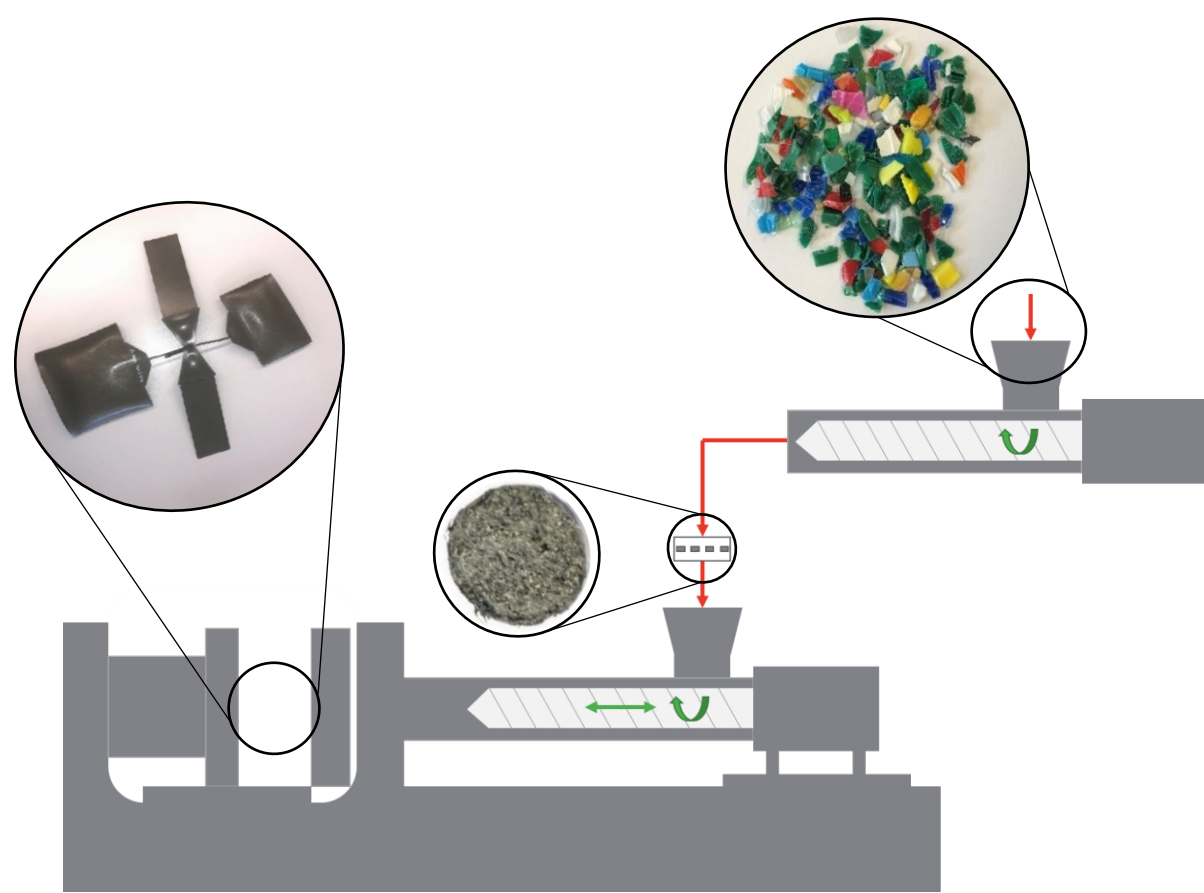
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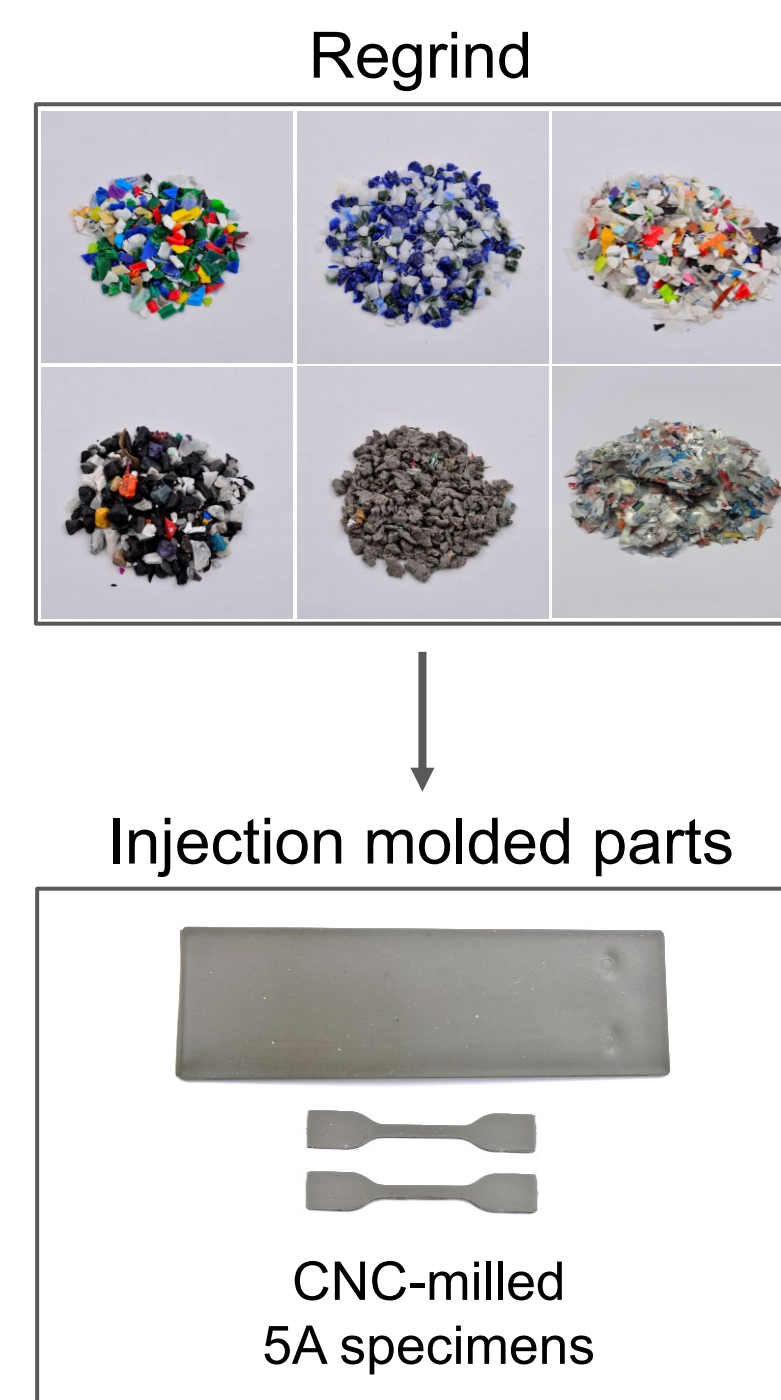


### Introduction

- Modified injection molding with only one material melting step prevents the material from degradation
- Possible for clean or pre-treated post-consumer and post-industrial waste fractions
- Assessment of the quality of input and output materials based on characteristic key values



### Experimental

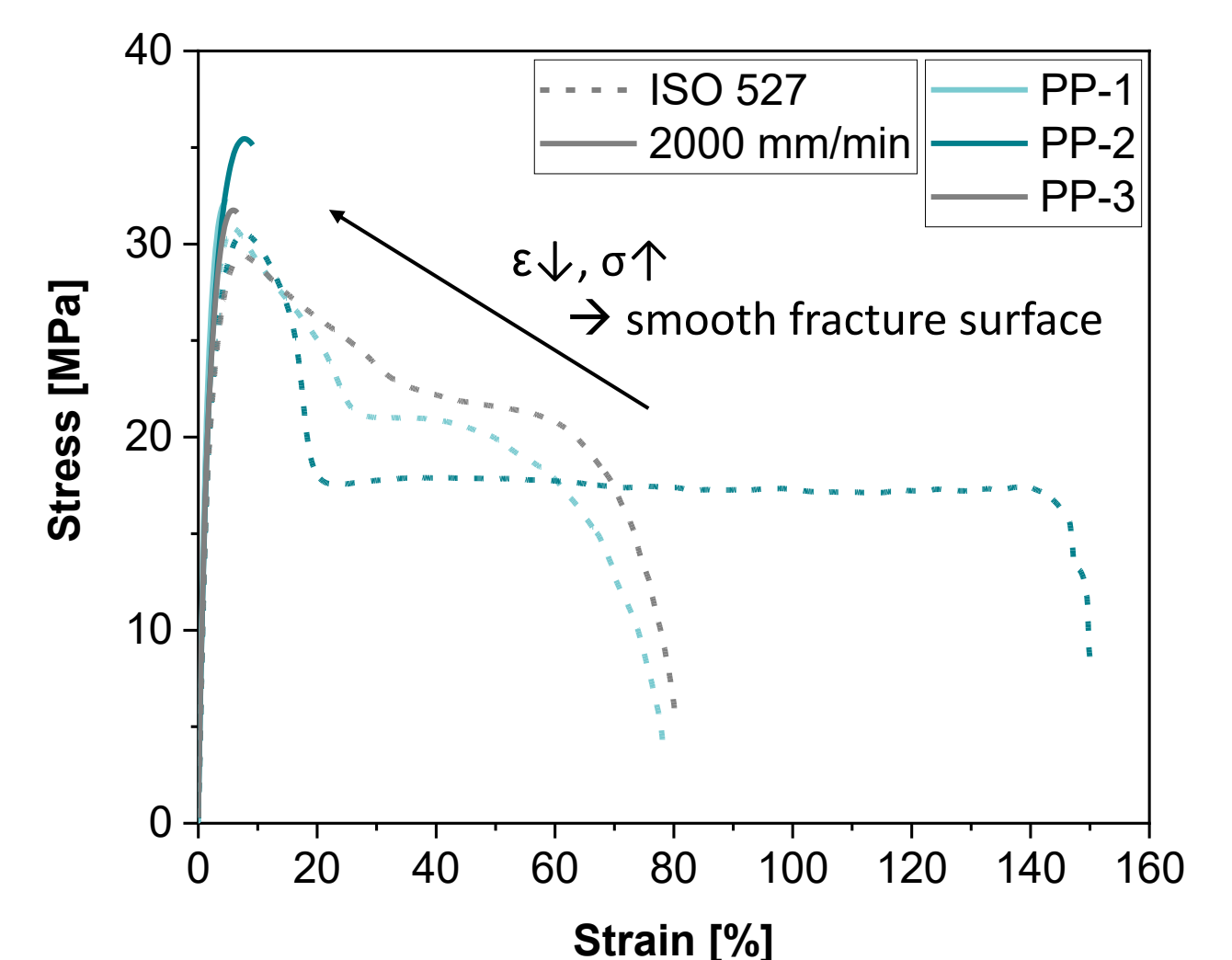
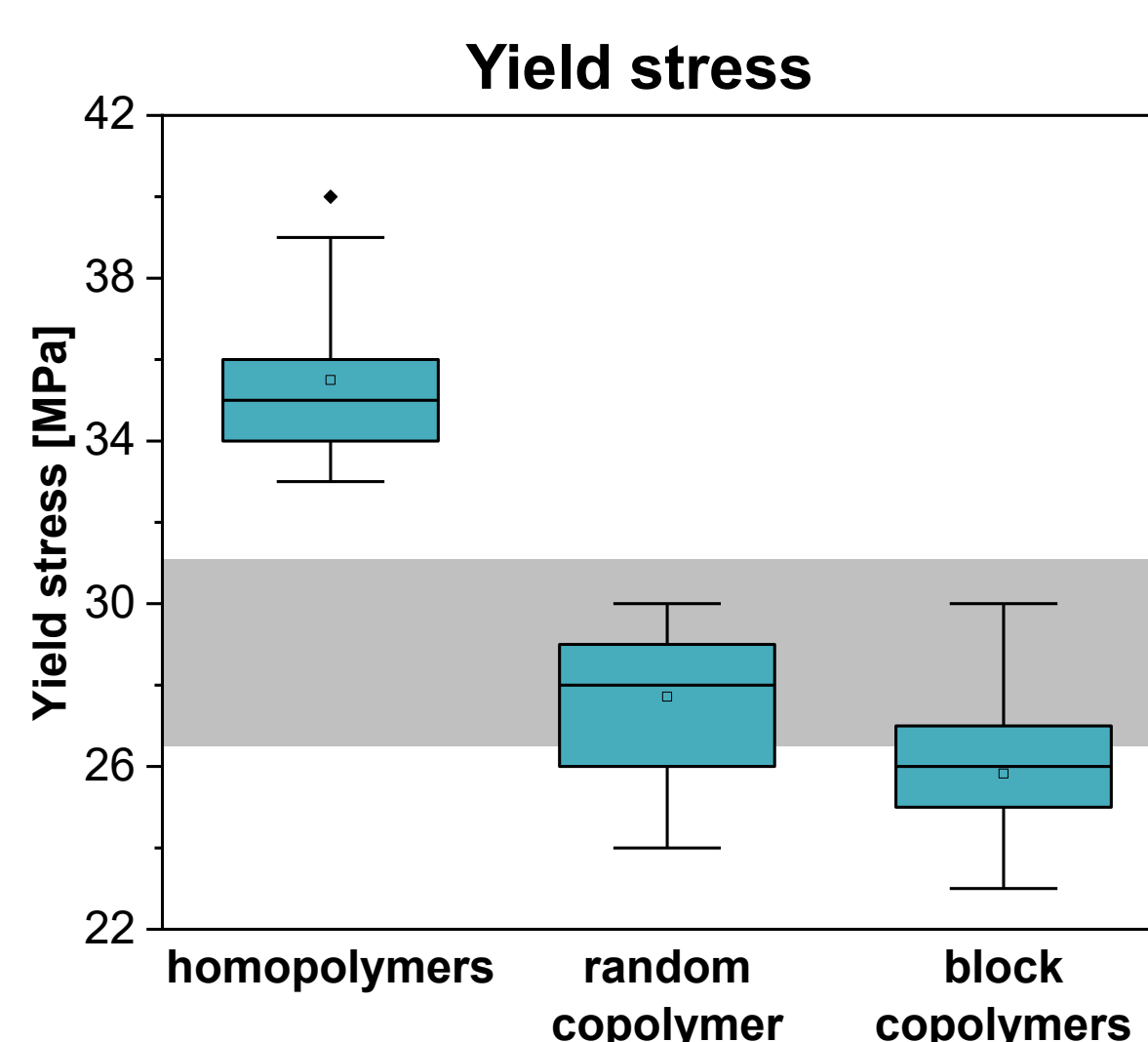
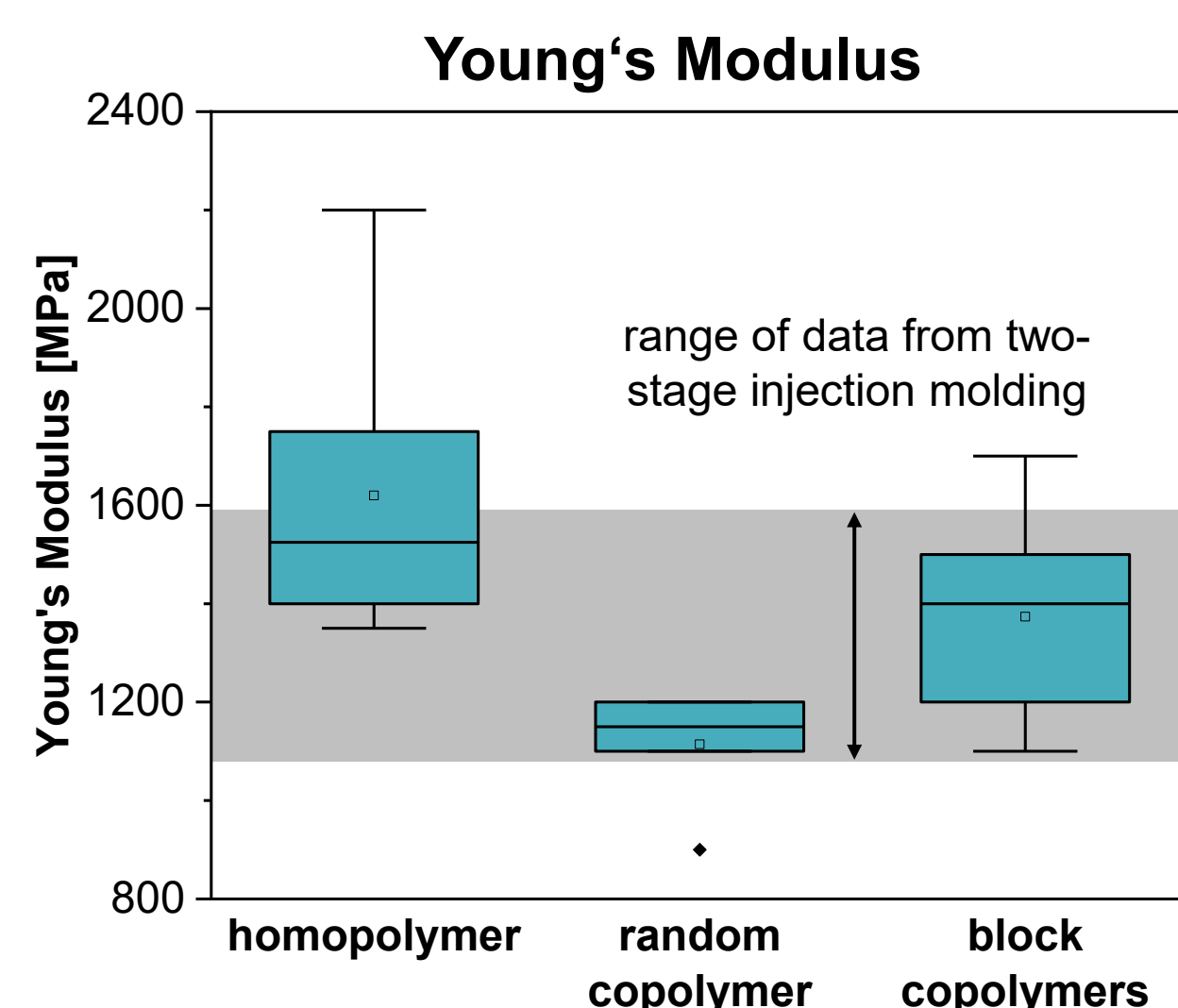
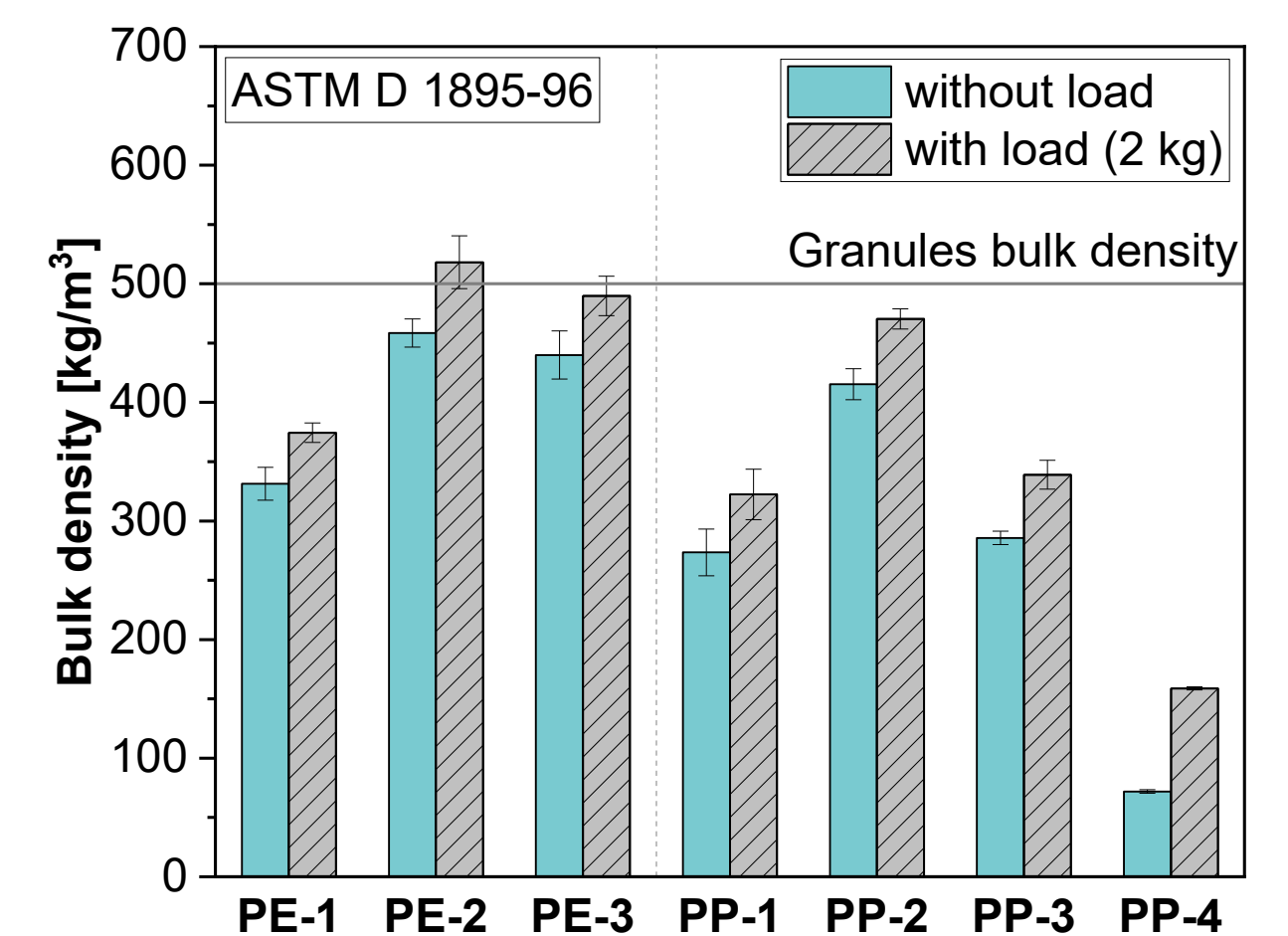


Bulk density  
ASTM D 1895-96 Method C

Tensile test  
ISO 527 – 50 mm/min  
2000 mm/min  
Optical microscopy

### Results & Discussion

- Regrind is compressible (10-30 % with 2 kg)
- Bulk density of regrind is lower than bulk density of granules
- Rough estimation of size, aspect ratio of regrind flakes and processibility
- Feeding problems of PP-4 due to low bulk density
- Pre-yield: no/minor drawbacks in mechanical properties → stiffness and strength values are in the range of virgin PP copolymer grades
- Post-yield: lower strain at break due to contamination
- Identification of fracture initiation: foreign materials (e.g., aluminum), foreign plastics (e.g., PA, PET), degraded polymers, voids



source: data from borealisgroup.com & lyondellbasell.com

### Conclusions

- **Bulk density:** Parameter for the estimation of processibility; low bulk density leads to problems with the feeding of the regrind
- **Tensile test:** Stiffness properties are comparable to virgin PP copolymer grades; contaminations leads to low or strongly fluctuating strain at break values

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