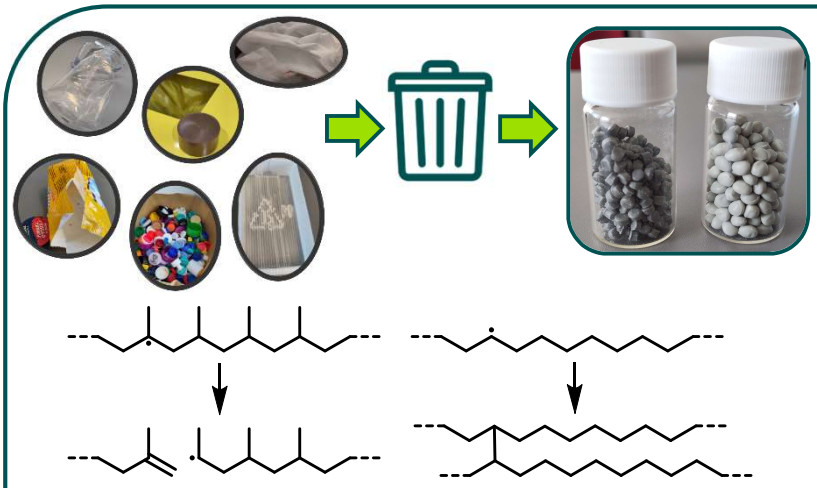
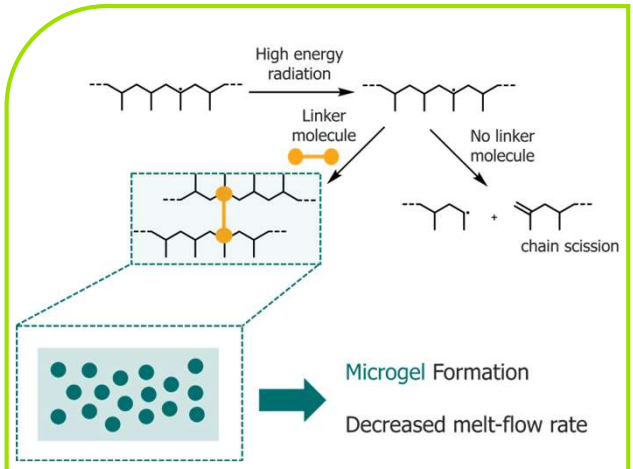
E-Beam Treatment of Post Consumer Polymer Waste

Increasing the melt viscosity of post-consumer polypropylene

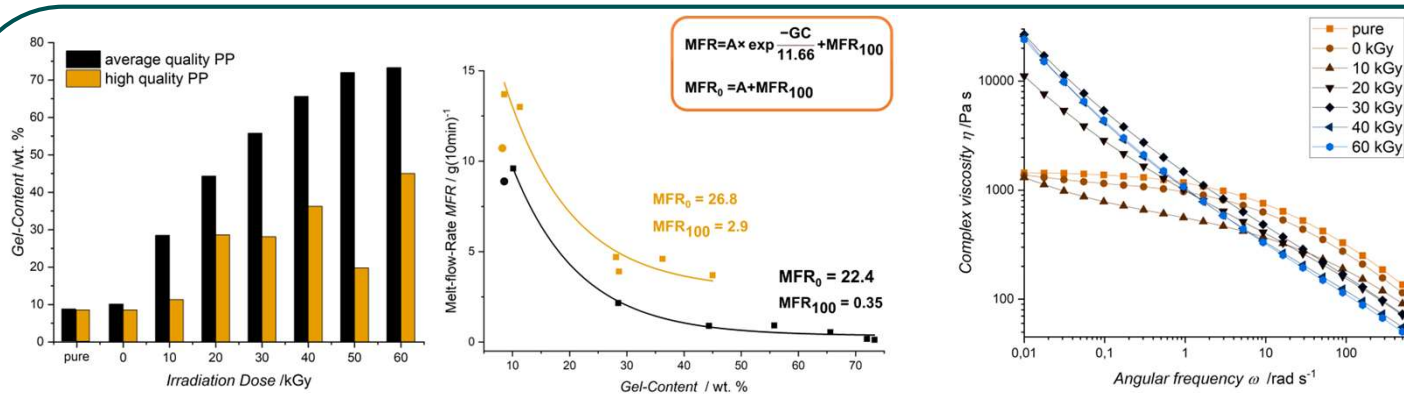
For Post Consumer Recycled (PCR) Polypropylene (PP), distributors mostly offer injection type PCR PPs with high melt-flow rates (MFR) and low melt viscosity. This is not favoured for extrusion applications, where low MFR values and sufficiently high melt strengths are required. Irradiation of PCR-PP with e-Beam offers a strategy to decrease the MFR and increase the melt viscosity.



PCR-PPs often contain polyethylene (PE) as impurities. Under irradiation, polypropylene will break via β chain-scission reaction, while polyethylene tends to cross-link



When PCR-PPS are irradiated in presence of linker molecules, the cross-linking reaction dominates over the β chain-scission



Two different grades of PCR-PP were irradiated: The average-quality PP with an estimated amount of 30% PE impurities and the high-quality PP with an estimated amount of 5 % PE. Sample irradiation leads to an increased Gel content – a microgel forms. The presence of PE impurities leads to a faster growth in gel-content. When the Gel-Content increases, the MFR reduces exponentially. Melt rheology shows shear thinning behaviour for all irradiated samples, in here only the viscosity curves for high quality PP are shown.

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