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Rubber Recycling

Compatibilization of waste tire rubber/poly(ethylene-co-vinyl acetate) blends using liquid rubber and electron beam irradiation.

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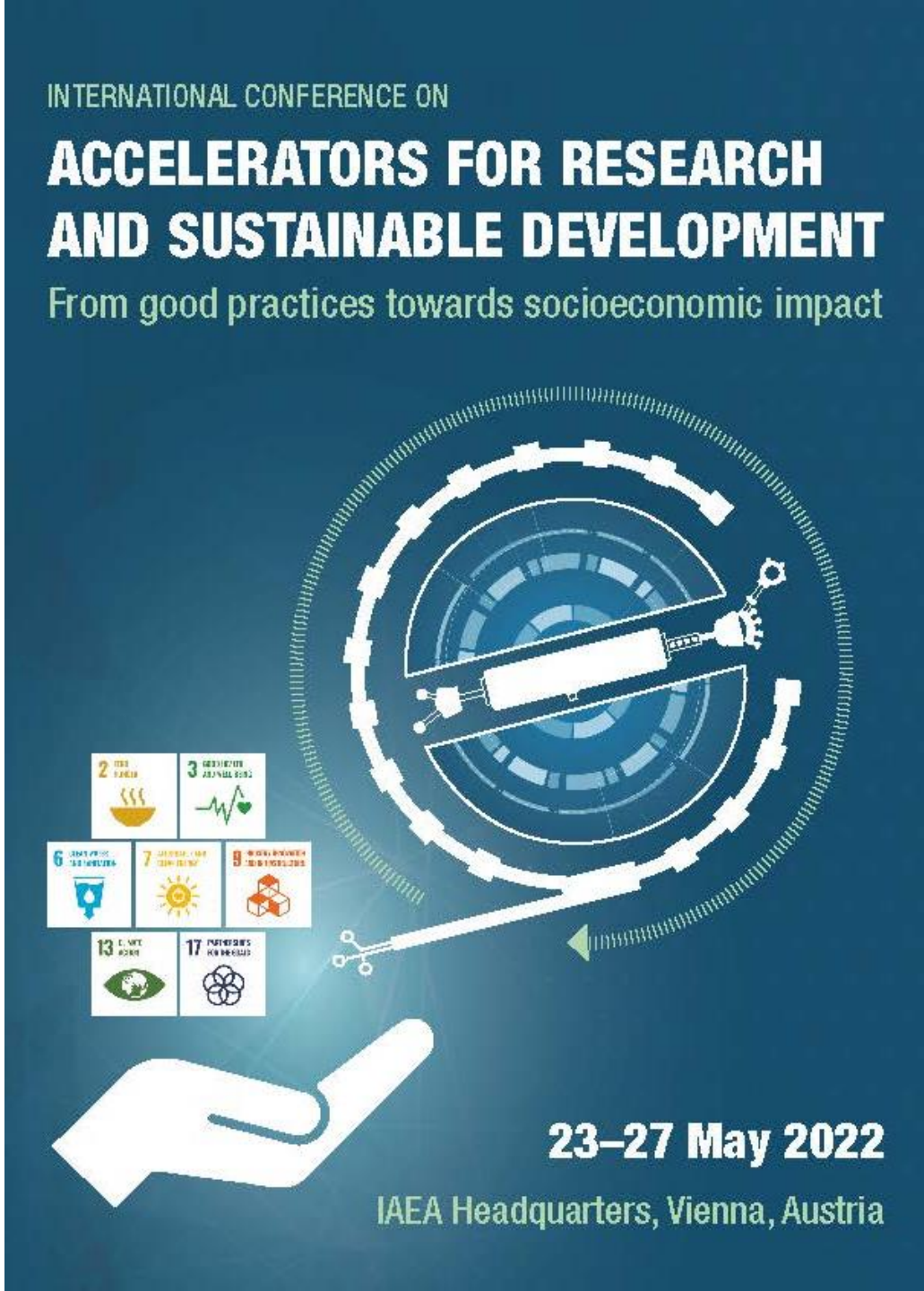

WASTE TIRES: WHAT'S NEXT?

COMPATIBILIZATION OF WASTE TIRE RUBBER/EVA BLENDS USING LIQUID RUBBER AND ELECTRON BEAM IRRADIATION

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International Conference on
Accelerators for Research and Sustainable Development
#Accelerators2022
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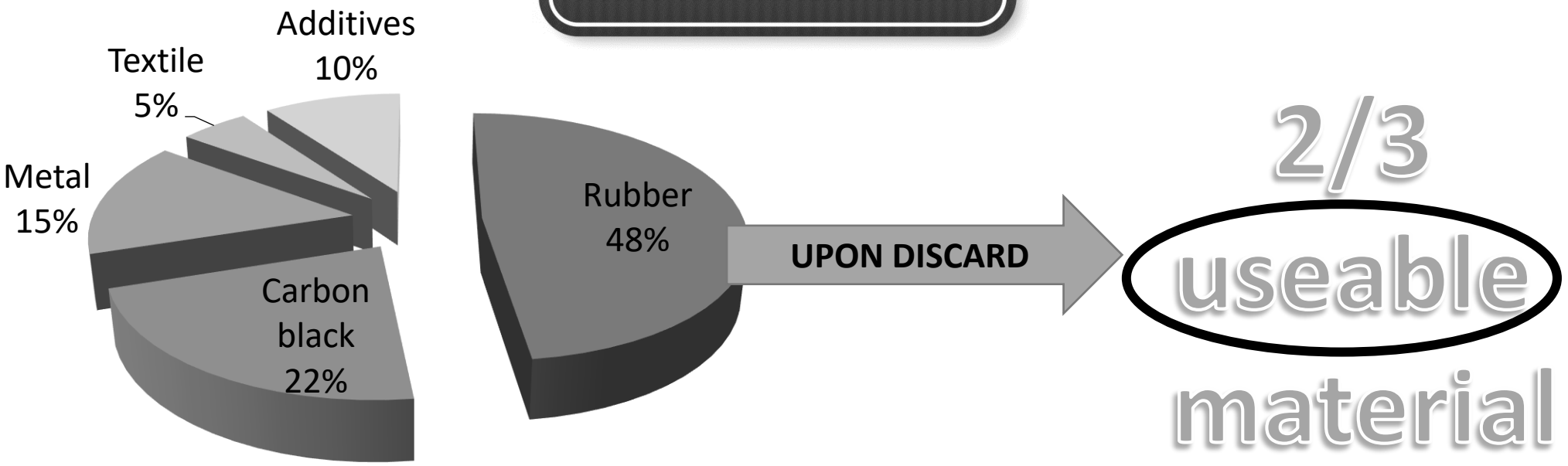
LET'S TALK TIRES

Rethink Tires

ROADTRIP



Composition of a tire

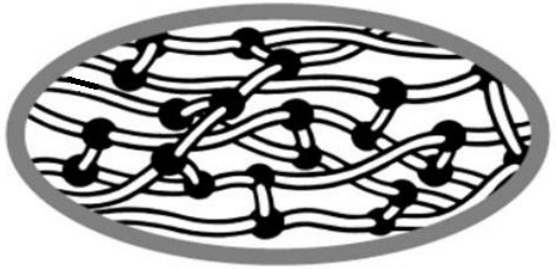
Waste Tires

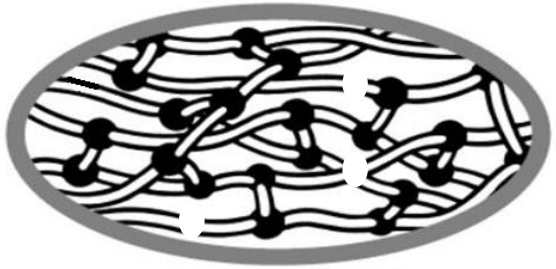
- Tires are vulcanized rubber - a thermosetting material.
- Difficult to recycle due to complex design, structure and mixture.
- Requires multiple processes such as down-sizing and reclaiming to enable recycling.
- The rubber undergoes degradation and devulcanization.

Vulcanized rubber

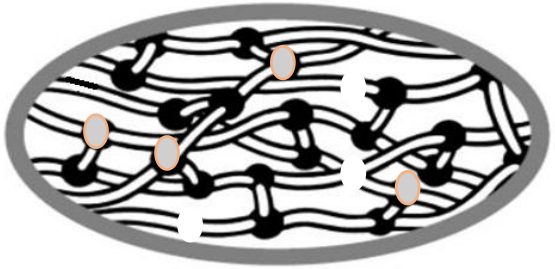
Degraded rubber

Devulcanized rubber





Down-sizing



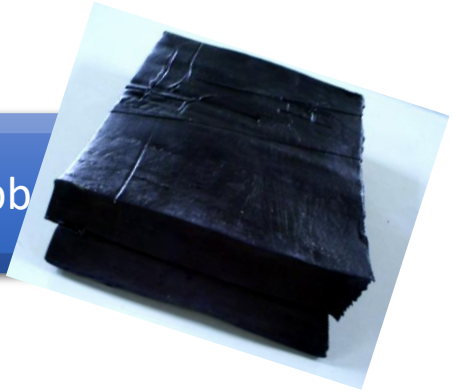
Reclaiming

Reduce, Re-use, Recycle

Methodology

EVA

Reclaimed Rubb



Internal mixer

120 °C, 10 MIN & 50 RPM

Compatibilizers APS, LR, MAEVA

Compression molding

130 °C, 6 MIN HEAT & 2 MIN COOL

Radiation sensitizers TMPTA, TPGDA, HVA2

Electron beam irradiation

2MeV, 5mA, 50kGy/PASS 0 – 200 kGy

Testing

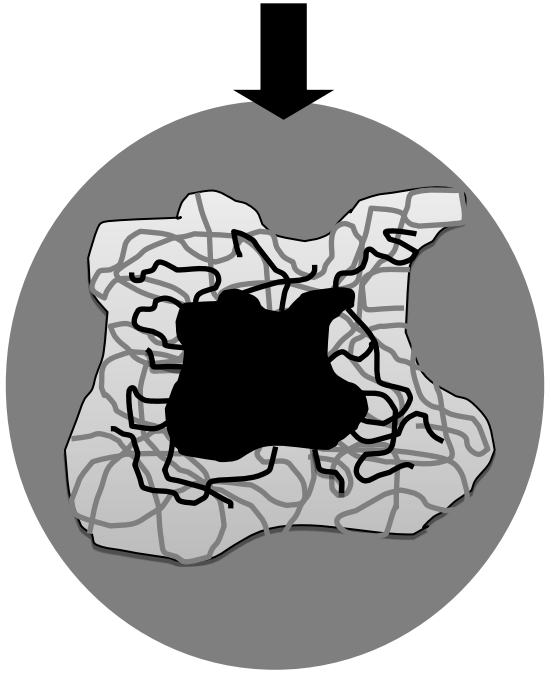
MECHANICAL, MORPHOLOGY, THERMAL & SWELLING

Compatibilization - Physical

Waste rubber particle with vulcanized core and devulcanized surface

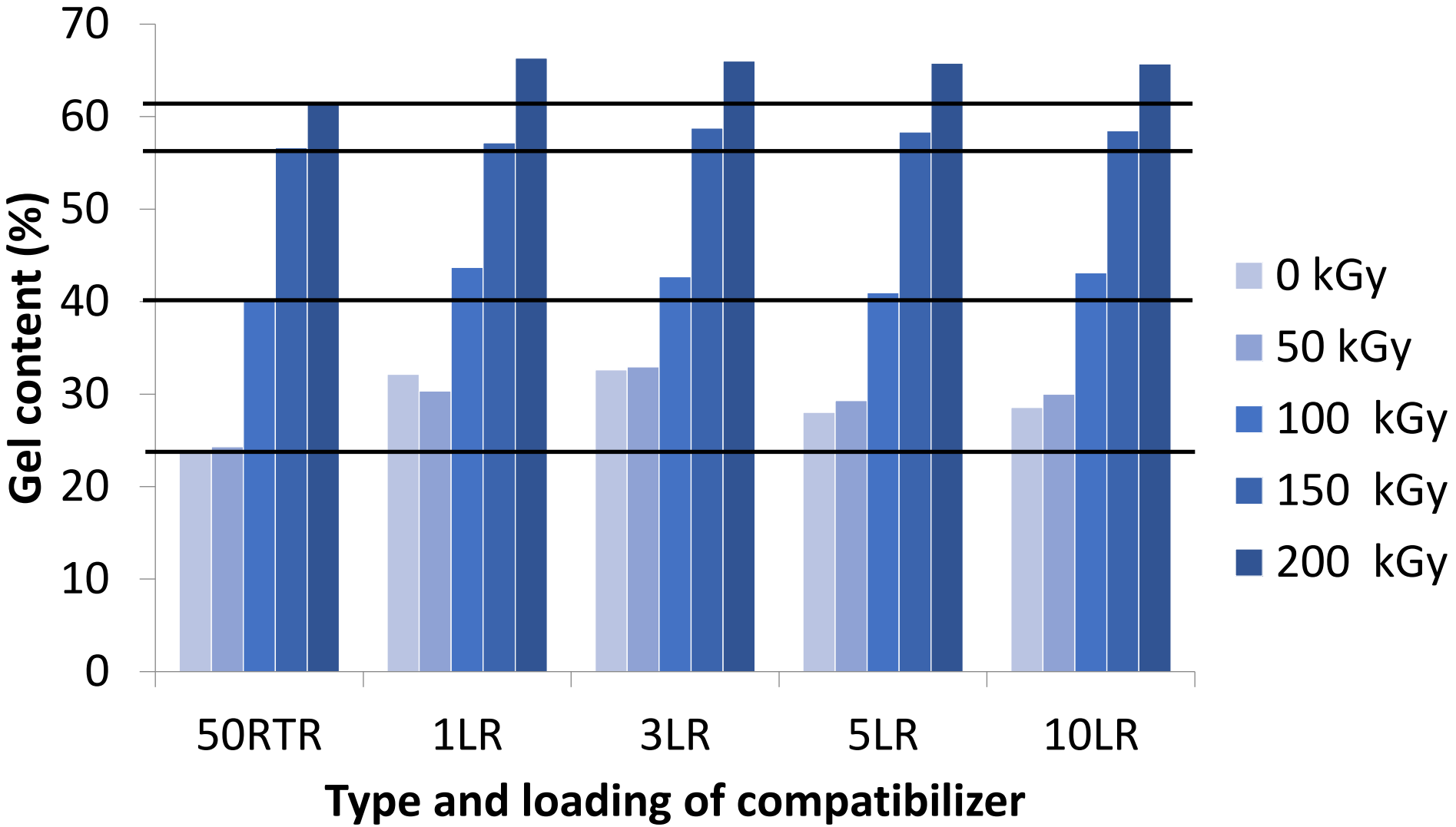
EVA

LR

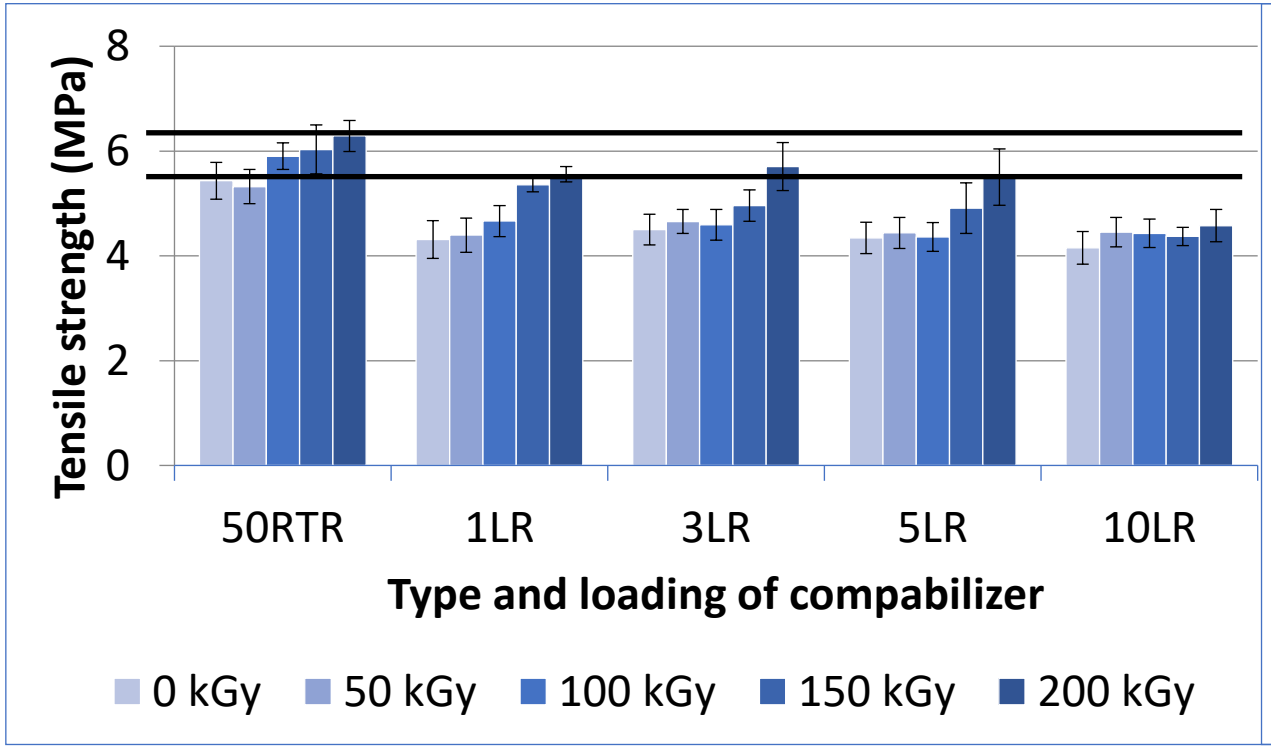


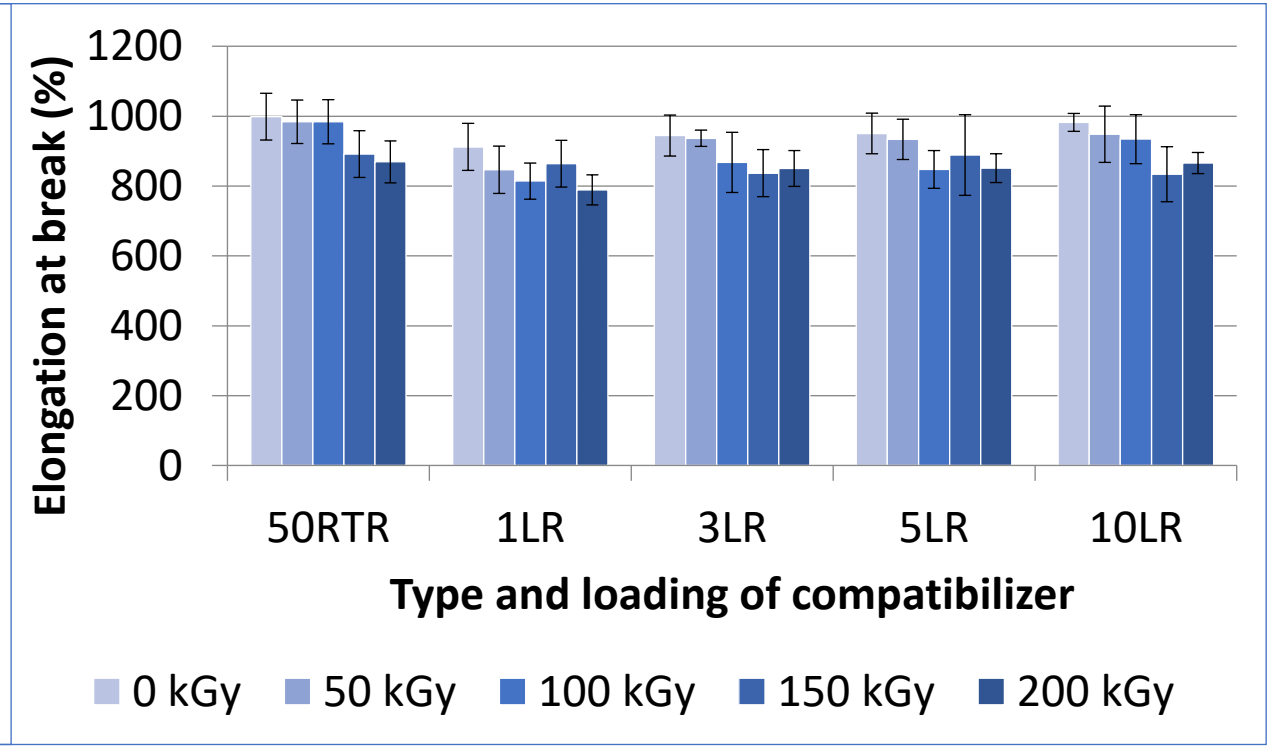
RTR/EVA compatibilized by LR

Crosslinking efficiency by EB irradiation

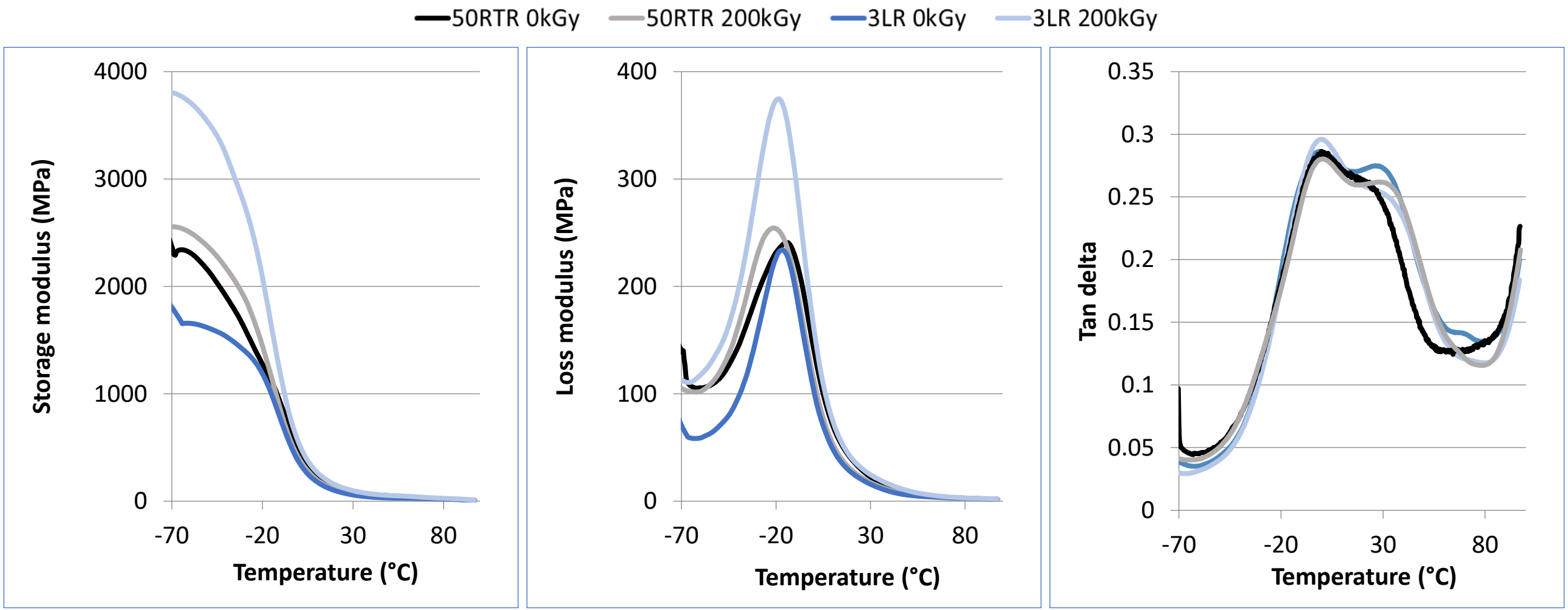


Tensile Properties





Dynamic Mechanical Properties



Conclusion

- Electron beam irradiation readily enhances the mechanical and dynamic properties of RTR/EVA blend. However, the improvement noted was minor.
- Crosslinking efficiency upon irradiation increases in the presence of liquid rubber.
- Addition of liquid rubber only improves dynamic properties of the blend following electron beam irradiation in comparison to RTR/EVA blend.

Thank you

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