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ELABORATION OF THERMOPLASTIC/ELASTOMER BLENDS USING A NEW MIXING DEVICE BASED ON ELONGATIONAL FLOW.

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A new lab-scale mixing device called RMX and based on an original concept was developed for polymer blends processing. Compared to standard laboratory mixers, involving mainly shear flows, this mixer was designed to promote flows with a high contribution of the elongational component, thus contributing to a highly efficient dispersive mixing.
The material to be mixed is alternatively pushed from one cylindrical chamber to the other through a central static mixing element by two reciprocally moving pistons. The geometry of the mixing element is a small diameter cylindrical die. The convergent and divergent elongational flows at the entrance and exit of the die are expected to contribute significantly to dispersive mixing.
A schematic view of the mixer is shown in Figure 1. It presents important technical features such as :
Hydraulically driven pistons (maximum pressure in chambers: 300 bars) Controlled piston speed (up to 60mm/s) Variable mixing volume (up to 100cc) Easy and separated feeding of components (for reactive systems) Tightness to liquids and gases authorizing the processing of materials containing volatile components Direct molding of the samples
In this work we aim at determining the impact of the elongational flow component on the final properties of a thermoplastic/elastomer blend. Immiscible blends of polypropylene (PP)/ethylene-propylene-diene (EPDM) – one of the most currently used thermoplastic/elastomer blend on the market – are studied for their specific properties as they can combine elasticity and melt processability.
The morphologies obtained on the RMX are compared to those obtained with an internal batch mixer (Haake Rheomix 600) equipped with counter-rotating, cam-type blades. Processing parameters such as mixing energies are calculated and used to compare data obtained with both equipments.