Title: Recyclable Semi-EV Sulphur Cured Natural Rubber Elastomer Composites

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Supplementary Table 1: t_{90} times for each unfilled formulation determined through MDR analysis at 150°C

	SEV Control	SEV CuMA-1/1	SEV CuMA-1/2	SEV CuMA-1/4	SEV CuMa-1/8	SEV CuMa-1/16
t_{90} / min	10	9.6	7.7	8.3	7.4	7.7

Supplementary Table 2: t_{90} times for each filled formulation determined through MDR analysis at 150°C.

	SEV Control CB	SEV CuMA 1/16 CB
t_{90} / min	4.20	8.67

Supplementary Table 3: Cross-link density from equilibrium swelling of unfilled recycled compounds

	SEV Control	SEV CuMA 1/16	SEV CuMA 1/8	SEV CuMA 1/4
	ν_{phy} / mol cm^{-3}	ν_{phy} / mol cm^{-3}	ν_{phy} / mol cm^{-3}	ν_{phy} / mol cm^{-3}
Pristine	$1.95\times10^{-4} \pm 8.13\times10^{-6}$	$1.61\times10^{-4} \pm 6.00\times10^{-7}$	$1.66\times10^{-4} \pm 9.35\times10^{-7}$	$1.60\times10^{-4} \pm 1.34\times10^{-6}$
R90V10	$2.20\times10^{-4} \pm 5.83\times10^{-6}$	$1.91\times10^{-4} \pm 1.66\times10^{-6}$	$1.98\times10^{-4} \pm 2.15\times10^{-6}$	$1.80\times10^{-4} \pm 1.45\times10^{-6}$
R80V20	$2.15\times10^{-4} \pm 1.22\times10^{-5}$	$1.83\times10^{-4} \pm 8.66\times10^{-7}$	$1.93\times10^{-4} \pm 2.29\times10^{-6}$	$1.71\times10^{-4} \pm 2.37\times10^{-6}$
R70V30	$2.00\times10^{-4} \pm 1.55\times10^{-6}$	$1.78\times10^{-4} \pm 1.18\times10^{-6}$	$1.67\times10^{-4} \pm 2.55\times10^{-7}$	$1.68\times10^{-4} \pm 6.65\times10^{-7}$

Supplementary Table 4: Ultimate tensile stress and strain values of unfilled pristine and recycled compounds.

	SEV Control		**SEV CuMA 1/16**		**SEV CuMA 1/8**		**SEV CuMA 1/4**	
	ε / mm/mm	σ / MPa	ε / mm/mm	σ / MPa	ε / mm/mm	σ / MPa	ε / mm/mm	σ / MPa
Pristine	14.5 ± 0.9	24.8 ± 3.8	11.8 ± 0.2	26.5 ± 0.7	11.7 ± 0.1	26.53 ± 0.7	11.9 ± 0.1	25.2 ± 2.1
R90V10	1.5 ± 0.3	0.8 ± 0.2	6.1 ± 2.3	4.6 ± 2.4	5.2 ± 1.4	3.5 ± 1.2	8.1 ± 1.7	7.0 ± 2.4
R80V20	3.9 ± 1.4	2.4 ± 0.8	7.9 ± 2.5	7.3 ± 3.6	5.4 ± 2.2	4.0 ± 2.5	7.2 ± 1.8	5.5 ± 2.3
R70V30	6.6 ± 1.8	4.6 ± 1.8	8.2 ± 1.2	7.1 ± 1.8	6.3 ± 2.1	4.9 ± 2.5	8.4 ± 0.7	7.4 ± 1.1

Supplementary Table 5: Cross-link density from equilibrium swelling of filled recycled compounds

	SEV Control CB	**SEV CuMA 1/16 CB**
	ν_{phy} / mol cm^{-3}	ν_{phy} / mol cm^{-3}
Pristine	$2.27\times10^{-4} \pm 9.84\times10^{-6}$	$2.33\times10^{-4} \pm 4.62\times10^{-6}$
R50V50	$1.87\times10^{-4} \pm 4.38\times10^{-6}$	$1.85\times10^{-4} \pm 1.55\times10^{-6}$
R90V10	$2.16\times10^{-4} \pm 4.55\times10^{-6}$	$1.85\times10^{-4} \pm 6.39\times10^{-6}$

Supplementary Table 6: Ultimate tensile stress and strain values of filled pristine and recycled compounds.

	SEV Control CB		**SEV CuMA 1/16 CB**	
	ε / mm/mm	σ / MPa	ε / mm/mm	σ / MPa
Pristine	6.7 ± 0.1	24.1 ± 0.5	5.9 ± 0.2	24.6 ± 0.6
R50V50	4.2 ± 0.3	15.7 ± 1.4	5.8 ± 0.1	20.9 ± 0.7
R90V10	3.3 ± 0.5	11.1 ± 1.5	5.9 ± 0.1	20.9 ± 0.6

Supplementary Table 7: Ultimate tensile stress and strain values of multiple recycling events

	ε / mm/mm	σ / MPa
Pristine	5.9 ± 0.2	24.6 ± 0.6
1st	5.8 ± 0.1	20.9 ± 0.7
2nd	6.1 ± 0.3	21.6 ± 0.6
3rd	6.0 ± 0.2	21.4 ± 1.1
4th	6.2 ± 0.1	22.6 ± 0.5

Supplementary Table 8: Cross-link density from equilibrium swelling of blended compound

SEV-Control-R50+CuMA-1/16-V50-CB

	ν_{phy} / mol/g
Pristine	$2.27\times10^{-4} \pm 9.84\times10^{-6}$
R50V50	$2.23\times10^{-4} \pm 1.94\times10^{-5}$

Supplementary Table 9: Ultimate tensile stress and strain values of blended compound

SEV-Control-R50+CuMA-1/16-V50-CB

	ε / mm/mm	ε / mm/mm
Pristine	6.7 ± 0.1	6.7 ± 0.1
R50V50	6.4 ± 0.1	6.4 ± 0.1

Supplementary Figure 1: Granulate achieved from describe methodology**.**