

# rCB GRADES AND SPECIFICATIONS PROPOSAL



# OBJECTIVE

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- + Establish specifications for recycled/recovered secondary raw material
- + Coordinate with regulatory bodies toward harmonization of standards
- + Help global recycling ecosystem understand needs of rubber industry to establish downstream market
- + Assess how ASTM/ISO can help normalize framework
- + Consider regulation that facilitates standardization of process for rubber industry
- + Partner with key stakeholders on future technologies to better recycle end-of-life tyres

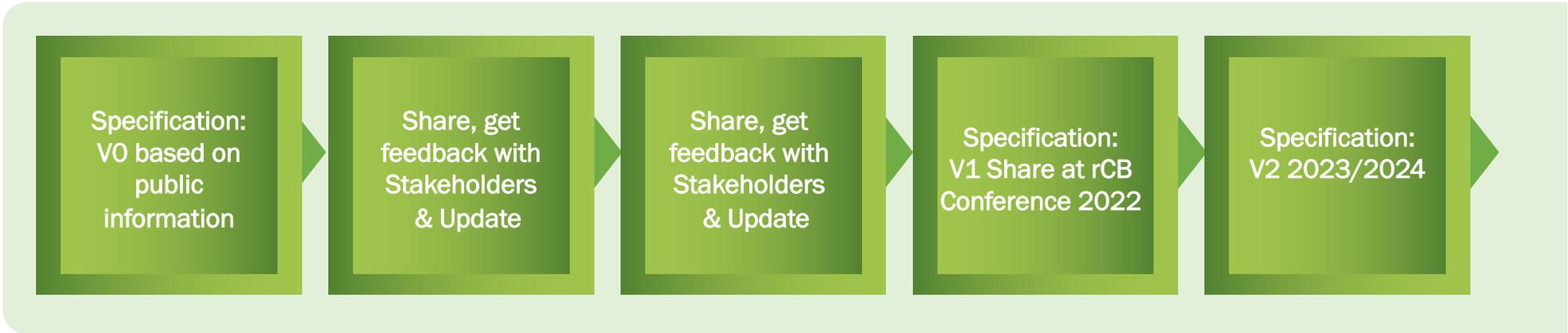


## WE AIMED TO

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- + Define, with the rCB community, an initial proposal for rCB grades definition and associated specifications
- + Improve the link between suppliers and users through a common language and understanding.
- + Raise awareness about the need for high quality and stability required by the tire and rubber goods industries.

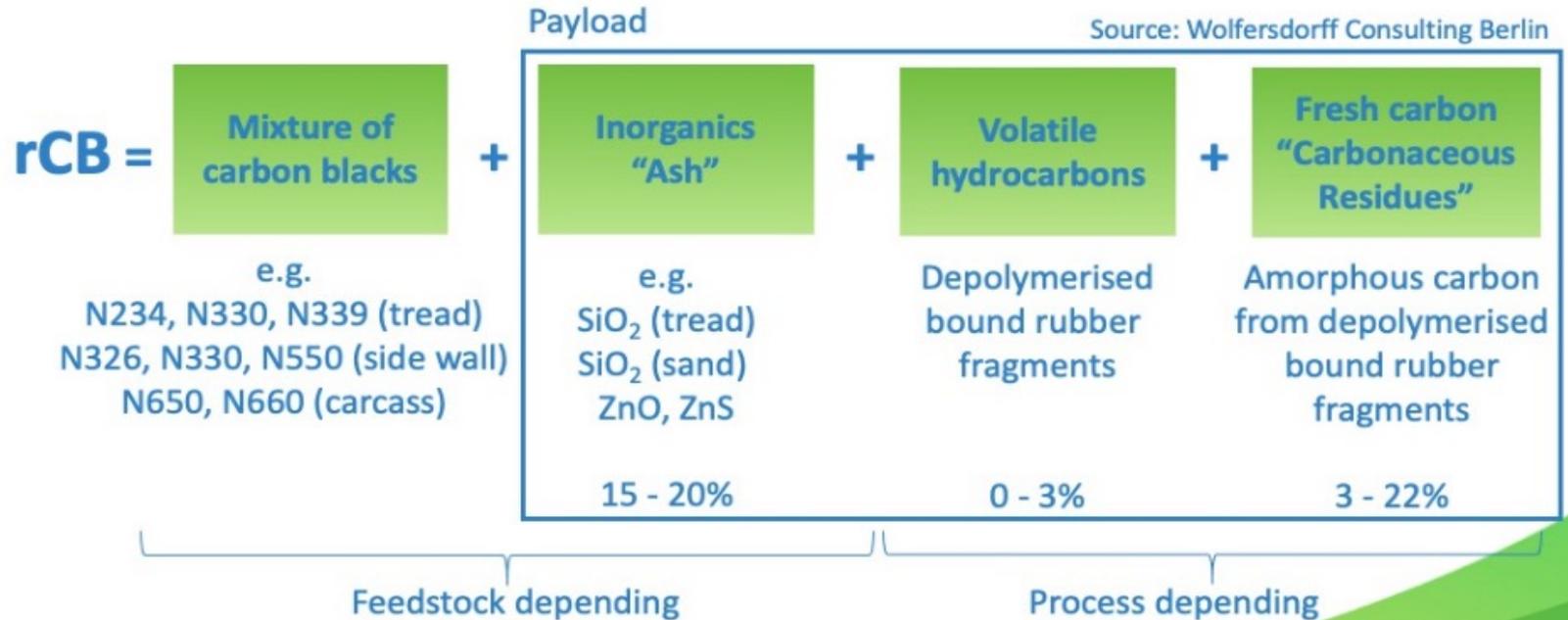
# PROPOSAL: THE RESULTS OF AN ITERATIVE AND COLLABORATIVE PROCESS



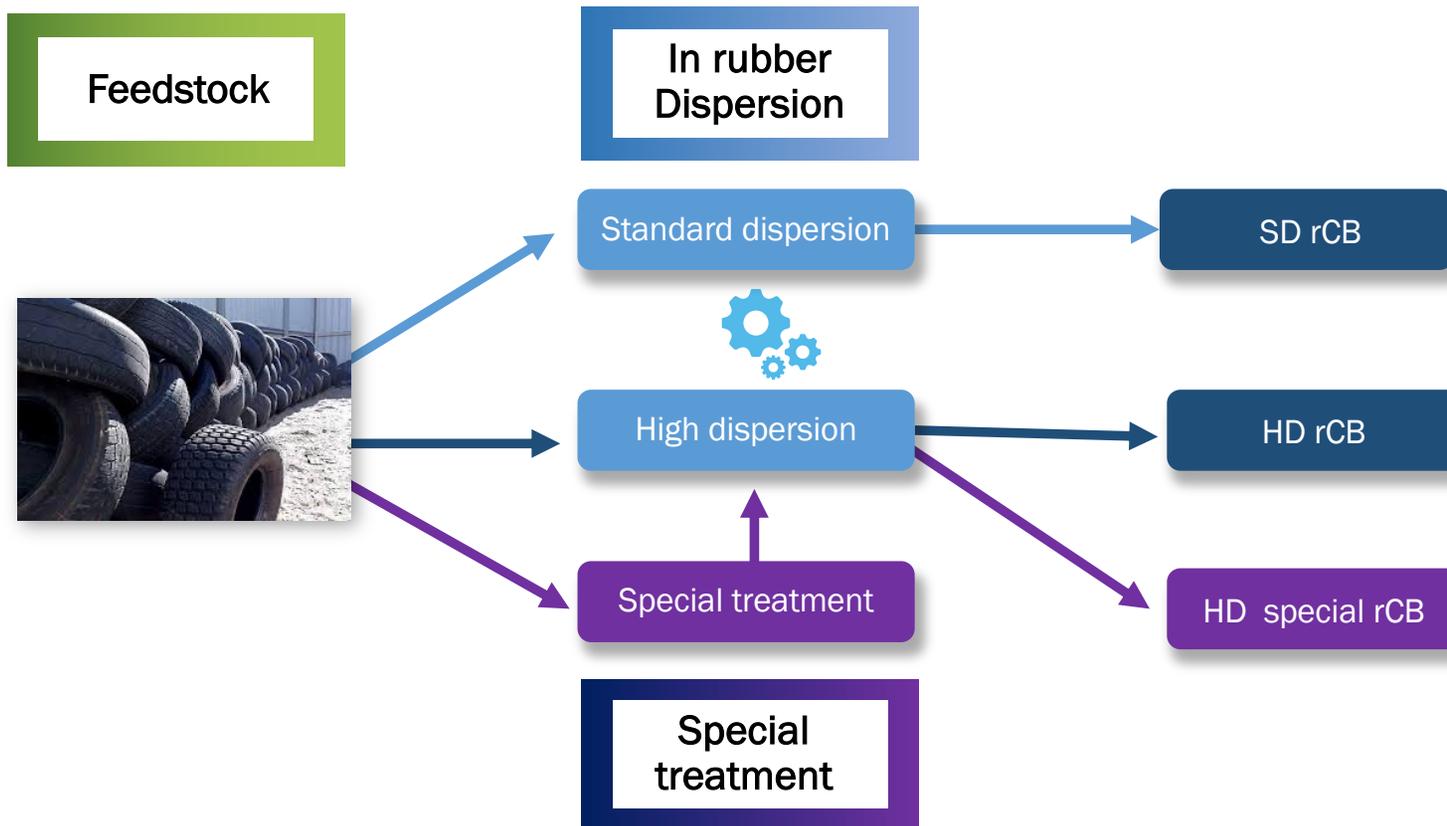
BS & Mi  
Martin von Wolfersdorff

BS & Mi  
Stakeholders (rCB, CB, rubber goods, tire maker Professional organisation )  
Martin von Wolfersdorff

# rCB IS A MIXTURE OF DIFFERENT PRODUCTS



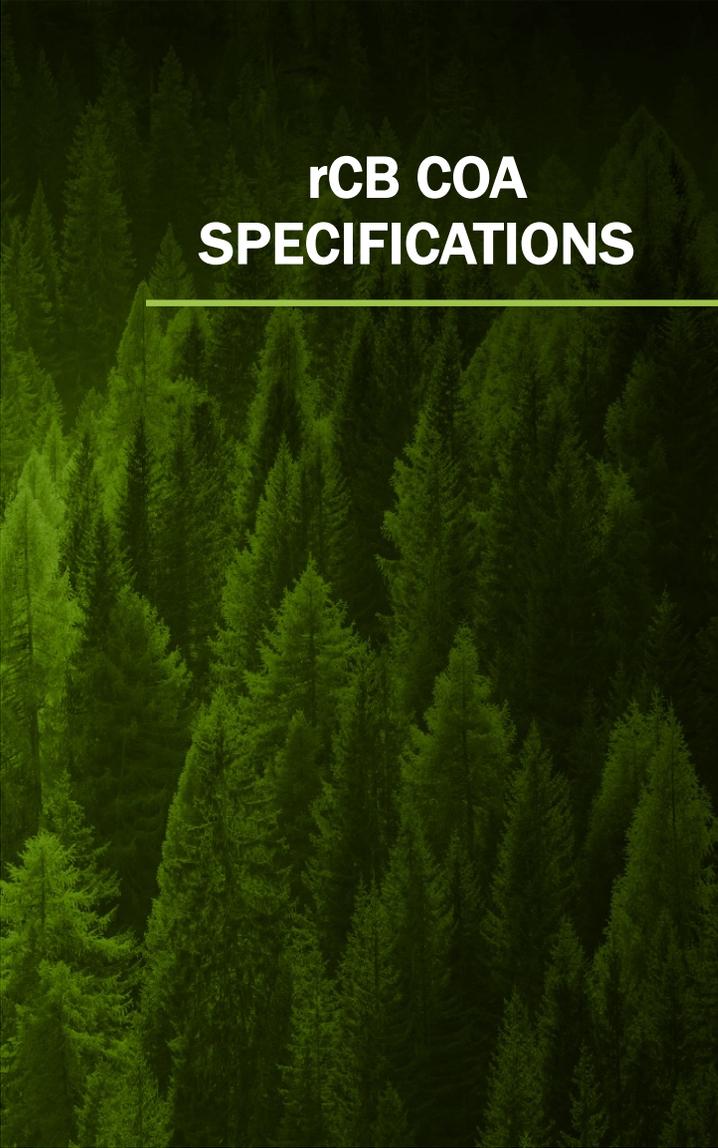
# POTENTIALLY SEVERAL rCB GRADES



# PROPOSAL GRADES DEFINITION : “PRODUCT DEFINITION PART”

Definition		Grade A1.1	Grade A1.2	Grade A1.3	Grade B	Grade C	Grade D
Stable ELT feedstock		ELT from PCR, TBR, AG, OTR ...			100% TBR	100% OTR	?
In rubber rCB dispersion	Laser diffraction (under development by ASTM / WK71958).	HD 1,8< D50 < 2.6 µm 7 <D99 < 10 µm	SD 2,5 <D50 <3,5 D99 : 20 +/- 2.5	HD 1,8< D50 < 2.6 µm 7 <D99 < 10 µm	HD 1,8< D50 < 2.6 µm 7 <D99 < 10 µm	HD 1,8< D50 < 2.6 µm 7 <D99 < 10 µm	?
Post-treatment (e.g. activation, ash leaching ...) &/or other special technology		No	No	Yes	No	No	?
Ash content	ASTM D1506	>15% / <20%	>15% / <20%	<20% ?	< 17%	< 17%	?
Ash Contaminants, including cleanliness		Global statement to be made for all rCB, proposal to have worldwide specification and not regional specifications					
PAH							

In addition to dispersibility differentiation, future grade option could include physico-chemical / new “pyrolysis” ELT treatment, leading to rCB with new set of in rubber properties



## rCB COA SPECIFICATIONS

### 1 Circular Economy

#### Recovered

+ Mixture of the CB and inorganic material in the ELT

#### rCB used as a filler

+ rCB is not “vCB”, however specific characterization methods are not yet fully available.

+ Filler dispersion is key for some demanding rubber application.

Today's rCB specifications are based on CB characterization methods with an aim to guarantee product consistency.

# CERTIFICATE OF ANALYSIS SPECIFICATION PROPOSAL

Definition		Grade A1.1	Grade A1.2	Grade A1.3	Grade B	Grade C	Grade D
ELT		ELT from PCR, TBR, AG, OTR ...			100% TBR	100% OTR	?
SSA by BET (STSA)	ASTM D6556	65 +/- 10	65 +/- 10	to be defined based on the nature and impact of the physicochemical treatment.	tbd	tbd	tbd
Ash content	ASTM D1506	>15% / <20%	>15% / <20%		< 17%	< 17%	tbd
pH	ASTM D1512	6 - 10	6 - 10		6 - 10	6 - 10	tbd
Toluene extract transmission	ASTM D1618	>80%	>80%		>80%	>80%	tbd
Heat loss at 125 °C	ASTM D1509	<1.5%	<1.5%		<1.5%	<1.5%	tbd
Total sulphur		< 3.5%	< 3.5%		< 3.5% (tbc)	< 3.5% (tbc)	tbd
Sieve residue (35 mesh)	ASTM D1514	10 ppm	10 ppm	10 ppm	10 ppm	10 ppm	tbd
Sieve residue (325 mesh / 44m)	ASTM D1514	300 ppm	700 ppm	300 ppm	300 ppm	700 ppm	tbd
Pellet hardness	ASTM D5230	< 80cN **	< 80cN **	< 80cN **	< 80cN **	< 80cN **	tbd
Pellet fines content	ASTM D1508	< 5% **	< 5% **	< 5% **	< 5% **	< 5% **	tbd

# EXAMPLE: CERTIFICATE OF ANALYSIS SPECIFICATION PROPOSAL

	Characteristic	ASTM Method	Grade A1.1
C O A	SSA by BET (STSA)	ASTM D6556	65 +/- 10
	Ash content	ASTM D1506	>15% / <20%
	pH	ASTM D1512	6 - 10
	Toluene extract transmission	ASTM D1618	>80%
	Heat loss at 125°C	ASTM D1509	<1.5%
	Total sulphur		< 3.5%
	Sieve residue (35 mesh)	ASTM D1514	10 ppm
	Sieve residue (325 mesh / 44m)	ASTM D1514	300 ppm
	Pellet hardness	ASTM D5230	< 80cN **
Pellet fines content	ASTM D1508	< 5% **	

Linked to: ELT feedstock and pyrolysis process consistency

Linked to: Pelletization/ packaging process consistency



## 2023/2024: POTENTIAL EVOLUTIONS

### Stability of the rCB:

- + **Ash%** evolution of the method (ASTM: TGA new Method) and specification.
- + **Toluene discoloration specifications** => evolution of the minimum tolerance based on future studies?
- + **Organic Volatile content:** ASTM confirmation of the interest and definition of specifications.

### In Rubber properties:

- + **rCB dispersion** Particle size distribution: fine tuning of specifications and method for pellets form.
- + **Modified OAN:** ASTM confirmation of the interest, definition of specifications.

### New from ASTM:

- + to be monitored.



## JOINT PERSPECTIVE ON THE FUTURE OF rCB

### So What?

- + **Bridgestone and Michelin believe** that confirming a standard that can be used by the rubber Industry creates a market, the white paper is a first step towards this goal

### Perspective:

- + In order to deliver our 100% sustainable materials in tyres by 2050, Bridgestone and Michelin believe that:
  - + Current rCB capacity that meets proposed specification is a small percentage compared with the overall carbon black market
  - + The current rCB spec won't allow for a total substitution of all grades of Virgin CB (vCB)
  - + Exponentially greater demand could be enabled by ongoing technical improvements
  - + Such improvements could create the conditions for the rCB market to reach up to 1 M tons by 2030\*
  - + There is a need to continue working to develop new pathways to increase "sustainable CB" use in rubber industry (higher quality rCB, blending with vCB, sCB from TPO, etc.) to eventually reach the 2050 target
  - + This effort will be enabled by open and traceable sets of independent certifications to guarantee product sustainability

\*Based on market assumptions and 3<sup>rd</sup> party expert input



## SUMMARY

- + A first version of rCB grades definitions and specification proposal was built with the rCB community & Worldwide standards are proposed.
- + Beginning of the journey, BS & Mi are committed to continue the actions to upgrade the proposal

# ACKNOWLEDGEMENT

**Woltersdorff**  
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**ETB**  
*ma*  
EUROPEAN  
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**PIRELLI**

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