



# Standard Classification System for Rubber Compounding Materials for Use in Computer Material Management Systems<sup>1</sup>

This standard is issued under the fixed designation D5899; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This classification is intended to establish a method to find compounding materials on a computer data base by both functional and chemical classification. This classification will include rubber compounding materials or ingredients normally used in formulating rubber compounds. This classification is not intended for use in rubber latex or solvent based rubber adhesive applications.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Significance and Use

2.1 Commercially available computer material management programs are being used regularly in the rubber industry. These programs typically will retrieve information from a raw material or compounding material data base by chemical name, CAS registry number, trade name, and supplier name. Retrieving information by these fields can present problems. The common chemical names are not standardized. IUPAC nomenclature is standardized but the names typically are too lengthy for easy retrieval. Also, the user may not have information such as trade name, supplier name, or CAS registry number.

2.2 An alternate method of retrieving information from a raw material or compounding material data base is to sort by classification. This has the added advantage of enabling a compounder to select a compounding material from a given classification for a new compound formulation.

## 3. Basis of Classification

3.1 This classification is based on two methods.

3.1.1 The primary method of classifying raw materials or compounding materials is on the basis of functionality. Func-

tionality is defined by the principal reason for the material's use in the rubber formulation. Even though some compounding materials may have multiple functions, only the principal function should be included in the functional classification. The compounding material should not be included under more than one functional classification.

3.1.2 Under each functional classification there is a second level of classification by chemical description.

## 4. Classification System

4.1 The classification for compounding materials given in a computer's material management system is as follows:

4.2 *Functional Classification*—Accelerators:

4.2.1 *Chemical Classification*:

4.2.1.1 Dithiocarbamates

4.2.1.2 Guanidines

4.2.1.3 Maleimides

4.2.1.4 Sulfenamides

4.2.1.5 Sulfenimides

4.2.1.6 Thiazoles

4.2.1.7 Thioureas

4.2.1.8 Thiurams

4.2.1.9 Dithiophosphates

4.2.1.10 Amines

4.2.1.11 Other

4.3 *Functional Classification*—Adhesion Promoters:

4.3.1 *Chemical Classification*:

4.3.1.1 Methylene donors

4.3.1.2 Resorcinol donors

4.3.1.3 Cobalt salts/compounds

4.3.1.4 Polyisocyanates

4.3.1.5 Other

4.4 *Functional Classification*—Antidegradants:

4.4.1 *Chemical Classification*:

4.4.1.1 Bisphenols

4.4.1.2 Polyphenols

4.4.1.3 Alkyl aryl phosphites

4.4.1.4 Alkyl aryl-p-phenylene diamines

4.4.1.5 Dialkyl-p-phenylene diamines

4.4.1.6 Diaryl-p-phenylene diamines

4.4.1.7 Mercaptobenzimidazoles

4.4.1.8 Quinolines

<sup>1</sup> This classification is under the jurisdiction of ASTM Committee D11 on Rubber and is the direct responsibility of Subcommittee D11.20 on Compounding Materials and Procedures.

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- 4.4.1.9 Substituted amines
- 4.4.1.10 Substituted phenols
- 4.4.1.11 Thiopropionates
- 4.4.1.12 Waxes
- 4.4.1.13 Other
- 4.5 *Functional Classification*—Antistatic Agents:
- 4.6 *Functional Classification*—Blowing Agents:
  - 4.6.1 *Chemical Classification*:
    - 4.6.1.1 Azodicarbonamide
    - 4.6.1.2 Carbonates
    - 4.6.1.3 Semicarbazides
    - 4.6.1.4 Sulfonylhydrazide
    - 4.6.1.5 Other
- 4.7 *Functional Classification*—Colorants:
  - 4.7.1 *Chemical Classification*:
    - 4.7.1.1 Iron oxide
    - 4.7.1.2 Titanium dioxide
    - 4.7.1.3 Other inorganic colorants
    - 4.7.1.4 Organic colorants
- 4.8 *Functional Classification*—Fillers, Extenders, and Reinforcing Agents:
  - 4.8.1 *Chemical Classification*:
    - 4.8.1.1 Calcium carbonates
    - 4.8.1.2 Carbon blacks, fine particle size
      - (1) N100 series
      - (2) N200 series
      - (3) N300 series
      - (4) Other
    - 4.8.1.3 Carbon blacks, large particle size
      - (1) N400 series
      - (2) N500 series
      - (3) N600 series
      - (4) N700 series
      - (5) N800 series
      - (6) N900 series
      - (7) Other
    - 4.8.1.4 Conductive carbon blacks (other than given above)
    - 4.8.1.5 Other carbon blacks
    - 4.8.1.6 Clays
    - 4.8.1.7 Ground coal
    - 4.8.1.8 Floccs
    - 4.8.1.9 Reinforcing resins (reactive)
    - 4.8.1.10 Silicas
      - (1) Precipitated
      - (2) Pyrogene
      - (3) Mineral
    - 4.8.1.11 Silicates
    - 4.8.1.12 Other
  - 4.9 *Functional Classification*—Flame Retardants:
    - 4.9.1 *Chemical Classification*:
      - 4.9.1.1 Halogen donors
      - 4.9.1.2 Metallic oxides
      - 4.9.1.3 Hydrates
      - 4.9.1.4 Other
  - 4.10 *Functional Classification*—Fungicides:
    - 4.10.1 *Chemical Classification*:
      - 4.10.1.1 Organic
      - 4.10.1.2 Other
- 4.11 *Functional Classification*—Masterbatches:
  - 4.11.1 *Chemical Classification*:
    - 4.11.1.1 Internal (rework)
    - 4.11.1.2 External
- 4.12 *Functional Classification*—Odorants:
  - 4.12.1 *Chemical Classification*:
    - 4.12.1.1 Essential oils
    - 4.12.1.2 Other
- 4.13 *Functional Classification*—Processing Materials:
  - 4.13.1 *Chemical Classification*:
    - 4.13.1.1 Ester plasticizers, phthalates
    - 4.13.1.2 Ester plasticizers, other
    - 4.13.1.3 Hydrocarbon resins and mixtures
    - 4.13.1.4 Peptizers (chemical plasticizers)
    - 4.13.1.5 Petroleum oil, aromatic
    - 4.13.1.6 Petroleum oil, naphthenic
    - 4.13.1.7 Petroleum oil, paraffinic
    - 4.13.1.8 Soaps and mixtures
    - 4.13.1.9 Polyethylenes
    - 4.13.1.10 Titanates
    - 4.13.1.11 Other
- 4.14 *Functional Classification*—Promoters and Coupling Agents for Fillers and Reinforcing Agents:
  - 4.14.1 *Chemical Classification*:
    - 4.14.1.1 Amines
    - 4.14.1.2 Silanes
    - 4.14.1.3 Titanates
    - 4.14.1.4 Other
- 4.15 *Functional Classification*—Rubbers:
  - 4.15.1 *Chemical Classification*:
    - 4.15.1.1 Acrylonitrile butadiene rubber (NBR/HNBR/XNBR)
      - (1) NBR; ACN < 22.9 %
      - (2) NBR; 23 % < ACN < 29.9 %
      - (3) NBR; 30 < ACN < 37.9 %
      - (4) NBR; 38 < ACN < 44.9 %
      - (5) NBR; ACN > 45 %
      - (6) Hydrogenated NBR (HNBR)
      - (7) Carboxylated NBR (XNBR)
      - (8) Other
    - 4.15.1.2 Acrylonitrile butadiene rubber/polyvinyl chloride (NBR/PVC)
    - 4.15.1.3 Acrylic rubber (ACM)
    - 4.15.1.4 Bromobutyl rubber (BIIR)
    - 4.15.1.5 Butyl (IIR)
    - 4.15.1.6 Chlorobutyl rubbers (CIIR)
    - 4.15.1.7 Chlorosulfonated polyethylene (CSM)
    - 4.15.1.8 Epichlorohydrin rubber (ECO)
    - 4.15.1.9 Ethylene/acrylic rubber (AEM)
    - 4.15.1.10 Ethylene Propylene rubber (EPM, EPDM)
      - (1) EPM
      - (2) EPDM; ML (1 + 4) 125°C < 45
      - (3) EPDM; 45.1 < ML (1 + 4) 125°C < 59.9
      - (4) EPDM; ML (1 + 4) > 60
      - (5) Other

- 4.15.1.11 Ethylene vinylacetate rubber (EVM: 40–80 % VA)
- 4.15.1.12 Fluoro rubber (FKM)
- 4.15.1.13 Natural rubber and synthetic polyisoprene (NR and IR)
- (1) NR
- (2) IR
- (3) Other
- 4.15.1.14 Polybutadiene rubber (BR)
- (1) BR; high-cis; >92
- (2) BR; low-cis; <92
- (3) Vinyl BR (VBR)
- (4) Oil Ext. BR (OE-BR)
- (5) Other
- 4.15.1.15 Polychloroprene (CR)
- (1) M-grade
- (2) S-grade
- (3) XD-grade (Xantogen disulfide)
- (4) Other
- 4.15.1.16 Polynorborene
- 4.15.1.17 Polysulfide (T)
- 4.15.1.18 Propylene oxide rubber (PO)
- 4.15.1.19 Silicone rubber (Q)
- 4.15.1.20 Styrene butadiene rubber (SBR)
- (1) SBR 1000; hot emulsion
- 4.15.1.21 SBR 1500; cold emulsion
- (1) SBR 1600; cold emulsion, black extended masterbatch
- (2) SBR 1700; cold emulsion, oil extended masterbatch
- (3) SBR 1800; cold emulsion, black and oil extended masterbatch
- (4) High styrene SBR
- (5) Solution SBR (S-SBR)
- (6) Solution-vinyl-SBR (S-VSBR)
- (7) Other
- 4.15.1.22 Other
- 4.16 *Functional Classification*—Retarders and Inhibitors:
- 4.16.1 *Chemical Classification*:
- 4.16.1.1 Organic acids
- 4.16.1.2 Phthalic anhydride
- 4.16.1.3 Phthalimides
- 4.16.1.4 Other
- 4.17 *Functional Classification*—Tackifiers:
- 4.17.1 *Chemical Classification*:
- 4.17.1.1 Hydrocarbon resins
- 4.17.1.2 Phenolic resins
- 4.17.1.3 Rosins and rosin derivatives
- 4.17.1.4 Other
- 4.18 *Functional Classification*—Thermoplastics:
- 4.18.1 *Chemical Classification*:
- 4.18.1.1 PE
- 4.18.1.2 PP
- 4.18.1.3 PS
- 4.18.1.4 Other
- 4.19 *Functional Classification*—Vulcanizing Agents and Activators:
- 4.19.1 *Chemical Classification*:
- 4.19.1.1 Amine activators
- 4.19.1.2 Coagents for peroxide cures
- 4.19.1.3 Fatty acid activators
- (1) Stearic acid
- (2) Other
- 4.19.1.4 Glycol activators
- 4.19.1.5 Lead compounds
- 4.19.1.6 Magnesium compounds
- 4.19.1.7 Magnesium oxide
- 4.19.1.8 Magnesium hydroxide
- 4.19.1.9 Peroxides
- (1) Dialkyl peroxides
- (2) Diacyl peroxides
- (3) Perketal peroxides
- (4) Other peroxides
- 4.19.1.10 Phenolic curing resins
- 4.19.1.11 Sulfur
- 4.19.1.12 Sulfur donors
- (1) Alkyl phenol disulfide
- (2) Dithiodimorpholine
- 4.19.1.13 Zinc compounds
- (1) Zinc oxide
- (2) Other zinc salts
- 4.19.1.14 Other
- 4.20 *Functional Classification*—Other

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