





***ENCYCLOPEDIA OF  
INDUSTRIAL CHEMICAL  
ADDITIVES***

**VOLUME IV**

*Compiled by*

**Michael and Irene Ash**

*Chemical Publishing Co., Inc.  
New York, N.Y.*

# **Encyclopedia of Industrial Chemical Additives, Volume 4**

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## **PREFACE**

Volume IV of this Encyclopedia of Industrial Chemical Additives serves as a supplement to the original set published two years ago. All the additive products in this edition are new. This supplement therefore serves as an update for new functional chemical additives in a continued effort to present comprehensive coverage of national and international additives in industry.

Information from thousands of brochures, technical bulletins, and data sheets has been gleaned in order to make a complete profile on each additive product. Though sometimes limited by the information provided by the manufacturers, in most instances, the chemical ingredients, properties, form, applications, etc., of each product are discussed in detail.

The Encyclopedia is divided alphabetically into sections based on principal function. As many of these additive products have many uses, extensive cross-referencing is provided. Under each category the tradename products are also listed alphabetically. An index to all tradename products is provided for each volume so that any additive can be found without knowing its principal function.

We believe that this Encyclopedia will prove to be an invaluable reference tool for chemists, engineers, and all those associated with the chemical manufacturing industry. We would like to thank all those companies who made this work possible through their contributions and we would like to also extend our warmest heartfelt thanks to Roberta Dakan who has devoted herself to helping make this work as accurate and consistent as possible.

M. and I. Ash

## **NOTE**

Unless otherwise specified, when the temperatures are not given for properties such as viscosity, density, solubility, etc., a standard temperature of 25 C is to be assumed

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## **ABBREVIATIONS**

@.....	at
ABS.....	acrylonitrile-butadiene-styrene
APHA.....	American Public Health Association
approx.....	approximately
aq.....	aqueous
ASTM.....	American Society for Testing Materials
avail.....	available
avg.....	average
BMC.....	bulk molding compounds
B.P.....	boiling point
BS.....	British Standards
Btu.....	British thermal unit
C.....	Centigrade
Cal.....	calories
cap.....	capillary
CC.....	closed cup
cc.....	cubic centimeter
CD.....	cross direction
charact.....	characteristics
chem.....	chemical
cm.....	centimeter
COC.....	Cleveland Open Cup
coeff.....	coefficient
comp.....	compound
compat.....	compatibility, compatible
compr.....	compressive
conc.....	concentrated, concentration
conduct.....	conductivity
const.....	constant
cP.....	centipoise(s)
cps.....	centipoise(s), cycles per second
cSt, cstks.....	centistokes
dec.....	decomposition, decomposes
decomp.....	decomposition
defl.....	deflection
dg.....	decigram
diam.....	diameter

dielec.	.....	dielectric
DIN	.....	Deutsche Industrie Normen
disp.	.....	dispersion, dispersible
dissip.	.....	dissipation
dist.	.....	distilled
distort	.....	distortion
DMF	.....	dimethylformamide
DOP	.....	diocyl phthalate
DOT	.....	Department of Transportation
DWV	.....	drain, waste, and vent
elec.	.....	electrical
elong	.....	elongation
EP	.....	extreme pressure
EPDM	.....	ethylene propylene-diene monomer
equiv.	.....	equivalent
esp	.....	especially
EVA	.....	ethylene vinyl acetate
exc.	.....	excellent
exp	.....	expansion
F	.....	Fahrenheit
F.P.	.....	freezing point
FAA	.....	Federal Aviation Agency
FB	.....	free base
FDA	.....	Food and Drug Administration
flamm.	.....	flammability
flex	.....	flexural
ft	.....	foot, feet
G	.....	giga
g	.....	gram
gal.	.....	gallon
gen'l.	.....	general
gr.	.....	gravity
GRAS	.....	generally regarded as safe
GRP	.....	glass-reinforced polyester
h	.....	hour
HAF	.....	high abrasion furnace carbon black
HB	.....	horizontal burning
HC	.....	hydrocarbon
HCHO	.....	formaldehyde
HCl	.....	hydrochloric
HDPE	.....	high-density polyethylene
HLB	.....	hydrophile-lipophile balance
hyd.	.....	hydroxyl
hydrog.	.....	hydrogenated
Hz	.....	hertz
ICC	.....	Interstate Commerce Commission
ignit	.....	ingition
in.	.....	inch
incl.	.....	including

incompat.....	incompatibility, incompatible
ingred.....	ingredient(s)
insol.....	insoluble
IPA.....	isopropyl alcohol
J .....	joule
k .....	kilo
kg .....	kilogram
l.....	liter
lb.....	pound
LDPE.....	low-density polyethylene
M.....	mega
m.....	milli or meter
M.P.....	melting point
m.w.....	molecular weight
max.....	maximum
MC.....	megacycle
MD.....	mold direction or machine direction
MDA.....	methylene disalicylic acid
MDI.....	methane diisocyanate
mech.....	mechanical
med.....	medium
MEK.....	methyl ethyl ketone
mfg.....	manufacturing
mg.....	milligram
MIBK.....	methyl isobutyl ketone
MIL.....	Military Specifications
min.....	minimum or mineral
misc.....	miscellaneous
ml .....	milliliter
mm.....	millimeter
mo.....	months
MOCA.....	methylene-bis-ortho-chloroaniline
mod.....	modulus
mos.....	months
MSDS.....	Material Safety Data Sheet
N.....	Newton
neut.....	neutralized
neutral.....	neutralization
NF.....	National Formulary
NIOSH.....	National Institute for Occupational Safety & Health
no.....	number
NR.....	natural rubber
o/w.....	oil-in-water
OC.....	open crucible
OSHA.....	Occupational Safety & Health Administration
oz.....	ounce
Pa.....	Pascal
pbw .....	parts by weight
pcf.....	pounds per cubic foot

PET.....	polyethylene terephthalate
pH.....	hydrogen-ion concentration
phr .....	parts per hundred parts of resin or rubber
pkgs .....	packages
PM .....	Pensky Marten
PMCC .....	Pensky Marten closed cup
POE .....	polyoxyethylene
PPD .....	piperidine pentamethylene dithiocarbamate
ppm .....	parts per million
prop.....	properties
psi.....	pounds per square inch
pt.....	pint, point
PU.....	polyurethane
PVAc.....	polyvinyl acetate
PVC.....	polyvinyl chloride
PW.....	potable water
qt.....	quart
quat.....	quaternary
R&B .....	Ring & Ball
r.h.....	relative humidity
ref. ....	refractive or reference
resist.....	resistance or resistivity
RIM.....	reaction injection molded
R.T.....	room temperature
s .....	second
S/S .....	step by step
S/T .....	short time
sapon.....	saponification
sl.....	slightly
SMC .....	sheet molding compounds
soften.....	softening
sol.....	solubility, soluble
sol'n.....	solution
solid.....	solidification
sp.....	specific
spec.....	specification
SS .....	stainless steel
std.....	standard
STEL.....	short term exposure limit
str .....	strength
surf.....	surface
SUS.....	Saybolt Universal seconds
TCC.....	Taggart Closed Cup
TD.....	transverse direction
TDI.....	toluene diisocyanate
tech.....	technical
temp.....	temperature
tens .....	tensile
Tg .....	glass transition temp.

therm	.....	thermal
THF	.....	tetrahydrofuran
TLV	.....	threshold limit value
TMC	.....	thick molding compounds
TOC	.....	Taggart Open Cup
trans	.....	transitional
UL	.....	Underwriter's Laboratory
USDA	.....	United States Department of Agriculture
USP	.....	United States Pharmacopeia
UV, uv	.....	ultraviolet
V	.....	volt
VC	.....	vinyl chloride or vinylidene chloride
veg.	.....	vegetable
visc.	.....	viscosity, viscous
vol.	.....	volume
W.E. or W. Elec.	.....	Western Electric
wk	.....	week
w/o	.....	water-in-oil
wt.	.....	weight
yrs	.....	years
μ	.....	microns
≈	.....	approximately equal to
<	.....	less than
≤	.....	less than or equal to
>	.....	greater than
≥	.....	greater than or equal to

# ***ACCELERATORS***

## **Accelerator BZ.** Akron Chem. Co.

*Chem. Descrip.:* Zinc dibutyl dithiocarbonate

*Category/Applications:* Very active, non-discoloring, nonstaining accelerator for EPDM, as well as NR and SR latexes; recommended also for use as a stabilizer and nondiscoloring antioxidant in uncured rubber applications; as a stabilizer in IIR; as an antioxidant in thermoplastic rubbers and hot melts; avail. as oil-treated version, Accelerator BZX

*Form:* Powder or pellets; Color: Off-white to cream

*Composition:* 95% min. purity

*Gen'l. Prop.:* Sol.: Sol. in acetone; negligible sol. in water; Sp. Gr.: 1.25; Melt Pt.: 104 C min.

*Ref.:* Data sheet

light-colored compounds, esp. shoe soling industry; not for use in black-filled compounds

*Form:* Nondusting powder; Color: White to beige

*Ref.:* Tech. chart

## **Accelerator EZ.** Akron Chem. Co.

*Chem. Descrip.:* Zinc diethyl dithiocarbonate

*Category/Applications:* Very active, non-discoloring, nonstaining accelerator for NR and SR latexes; active in latex without zinc oxide; can be used in dry rubber applications as an activator for the thiazoles

*Form:* Powder; Color: Off-white

*Composition:* 98% min. purity

*Gen'l. Prop.:* Sol.: Insol. in water and aliphatic and aromatic hydrocarbons; Sp. Gr.: 1.5; Melt Pt.: 172 C min.

*Ref.:* Data sheet

## **Accelerator D.** Anchor Chem Ltd.

*Chem. Descrip.:* Cyclo amine blended with organo metallic salt

*Category/Applications:* Accelerator similar in performance to Anchor DPG but offers better processing safety; can be used together with primary accelerators giving increased cure rate and degree of crosslinking; recommended for use in

## **Accelerator MF.** Akron Chem. Co.

*Chem. Descrip.:* 2-Benzothiazyl-N-morpholine disulfide

*Category/Applications:* Sulfur-bearing accelerator combining good cure activity with processing safety in natural and syn-

**Accelerator MZ****ACCELERATORS****Accelerator Z.P.D.**

thetic rubbers; useful in both tire and mechanical goods applications; used in the ratio of 1 part:2 parts Cure-Rite 18 with normal sulfur levels; produces good balance of properties in SBR and EPDM

*Form:* Powder; *Color:* Yellow-brown

*Composition:* 11% avail. sulfur

*Gen'l. Prop.:* Sp. Gr.: 1.48; Melt Pt.: 125 C

*Ref.:* Data sheet

**Accelerator MZ. Akron Chem. Co.**

*Chem. Descrip.:* Zinc dimethyl dithiocarbamate

*Category/Applications:* Very active, non-discoloring, nonstaining accelerator for NR, IR, BR, SBR, IIR, and EPDM rubbers as well as NR latex; generally used as a secondary accelerator with the thiiazoles; very effective in EPDM because of its activity; however, it may cause blooming in EPDM compound when used above 1 phr; also avail. in oil-treated version, Accelerator MZX

*Form:* Powder or pellets; *Color:* Off-white

*Composition:* 98% min. purity

*Gen'l. Prop.:* Sol.: Insol. in water and aliphatic and aromatic hydrocarbons; Sp. Gr.: 1.70; Melt Pt.: 240 C min.

*Ref.:* Data sheet

**Accelerator P.P.D. Akron Chem. Co.**

*Chem. Descrip.:* Piperidinium pentamethylene dithiocarbamate

*Category/Applications:* Accelerator for latex; requires zinc oxide for optimum activity; useful in rubber cements, in compounds containing white factice and for tank linings cured in place; effective peptizing agent for Neoprene G types; nondiscoloring and nonstaining

*Form:* Powder; *Color:* Creamy white

*Composition:* 98% min. purity

*Gen'l. Prop.:* Sol.: Sol. in hot water and in aromatic hydrocarbons; insol. in aliphatic hydrocarbons; Sp. Gr.: 1.2; Melt Pt.: 168 C min.; Storage Stability: Good

*Ref.:* Data sheet

**Accelerator Z.B.E.D. Akron Chem. Co.**

*Chem. Descrip.:* Zinc dibenzyl dithiocarbamate

*Category/Applications:* Accelerator; very active form of zinc dithiocarbamate; non-discoloring and nonstaining; safer processing than zinc diethyl dithiocarbamate; in latex, it is less likely to cause pre-cure at R.T. than other dithiocarbonates; typical ultra-accelerator at normal curing temps.; also useful as a secondary accelerator for the continuous vulcanization of butyl rubber extrusions

*Form:* Powder; *Color:* Creamy white

*Composition:* 95% min. purity

*Gen'l. Prop.:* Sol.: Insol. in water and hydrocarbons; Sp. Gr.: 1.41; Melt Pt.: 180–188 C; Storage Stability: Good

*Ref.:* Data sheet

**Accelerator Z.P.D. Akron Chem. Co.**

*Chem. Descrip.:* Zinc cyclopentamethylene dithiocarbamate

*Category/Applications:* Ultra-accelerator for dry, natural rubber; slightly less active and safer to process than Accelerator MZ and Accelerator EZ; nonpigmenting and nonstaining; easily incorporated into rubber; esp. useful in the formulation of footwear; used alone, may be considered too scorchy an accelerator for general use; used with small amounts of MBTS (0.05–0.2 phr) to improve processing safety and physical properties with no loss of curing speed

*Form:* Powder; *Color:* Off-white

*Composition:* 98% min. purity

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