Kerr McGee Chemical Corp Navasa, Branswick County, NC NCD 980 557 805

REFERENCE 15

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THE SOIL CHEMISTRY OF HAZARDOUS MATERIALS

James Dragun, Ph.D.



Hazardous Materials Control Research Institute Silver Spring, Maryland ls and Wastes in

Organic Chemical Biodegradation in Soil 421

TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar.

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TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar. (cont.)

benzo(a)carbazole 11H-benzo(a)carbazole benzo(b)carbazole 5H-benzo(b)carbazole 7H-benzo(c)carbazole 4H-benzo(def)carbazole benzo(b)chrysene benzo(b)fluoranthene benzo(ghi)fluoranthene benzo(j)fluoranthene benzo(k)fluoranthene benzo(a)fluorene 11H-benzo(a)fluorene benzo(b)fluorene FIH-benzo(b)fluorene benzo(c)fluorene 7H-benzo(c)fluorene benzofluoreneamine 2.3-benzofuran 7-benzo(b)furanol benzoic acid benzo(a)naphthacene benzo(b)naphtho(2,1-d)furan benzo(b)naphtho(2,3-d)furan benzo(b)naphtho(1,2-d)thiophene benzo(b)naphtho(2,1-d)thiophene benzo(b)naphtho(2,3-d)thiophene benzonitrile benzo(a)pentacene benzo(rst)pentaphene benzo(ghi)perylene benzo(c)phenanthrene benzo(c)picene benzo(a)pyrene benzo(e)pyrene 2,3-benzopyridine 3,4-benzopyridine benzo(f)quinoline benzo(h)quinoline benzo(b)thiophene benzo(k)xanthene bicyclohexyl 2,2'-binaphthalene 2.2'-binaphthyl biphenyl 3-(biphenyl)-4H-4-pyranone 1,2-butadiene

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TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar. (cont.)

1,3-butadiene butane butanoic acid 2-butanone 1-butene 2-butene t-butylhydroquinone 3-n-butylphenol 4-n-butylphenol 4-sec-butylphenol 1-butyne 2-batyne

carbon disulfide carbazole 9H-carbazole chrysene coronene m-cresol o-cresol p-cresol cyano-11H-benzo(b)fluorene cyanofluorene 1-cyanonaphthalene 2-cyanonaphthalene 2-cyanotoluene 3-cyanotoluene 4-cyantoluene 4H-cyclopenteno(d,e,f)phenanthrene 1,3-cyclohexadiene cyclohexane cyclohexene cyclopentadiene cyclopentane 4H-cyclopenta(d,e,f)phenanthrene cyclopentene

n-decane dibenz(ac)anthracene dibenz(a))anthracene dibenz(a))anthracene dibenzo(b,def)chrysene 13H-dibenzo(a,h)fluorene dibenzo(b,d)furan

TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar. (cont.)

TABLE 9

dibenzo(b,d)-2-furanol dibenzo(b,d)-3-furanol dibenzo(b,d)thiophene 2,6-di-t-butyl-4-methylphenol dicyclopentadiene 1,2-diethylbenzene 3.5-diethylphenol diethylsulfide 1,2-dihydroacenaphthylene 9,10-dihydroanthracene 9,10-dihydroacridine 2,3-dihydro-1H-benz(e)indene 2,3-dihydro-1H-idene 5,12-dihydronaphthacene ł. 1,4-dihydronaphthalene 2,3-dihydro-IH-phenalene 9,10-dihydrophenanthrene 6,7-dihydro-2-methyl-5H-I-pyridine 6,7-dihydro-3-methyl-SH-1-pyridine 6.7-dihydro-SH-1-pyridine 6,7-dihydro-5H-2-pyridine 1,2-dihydroxybenzene 1,3-dihydroxybenzene 2,2'-dihydroxybiphenyl 2,4-dihydroxytoluene 2,6-dihydroxytoluene 3,4-dihydroxytoluene di-isopropylhydroquinone 2,3-dimethylaniline 2,4-dimethylaniline 2,5-dimethylaniline 2,6-dimethylaniline 3.4-dimethylaniline 3,5-dimethylaniline 2,3-dimethylanthracene 2,6-dimethylanthracene 2,7-dimethylanthracene 9,10-dimethylanthracene 4,7-dimethylbenzo(b)furan 5,6-dimethylbenzo(b)furan 5,7-dimethylbenzo(b)furan 3.3'-dimethylbiphenyl 3,4'-dimethylbiphenyl 3,5-dimethylbiphenyl 4,4'-dimethylbiphenyl 2,3-dimethyl-1,3-butadiene 2,2-dimethyl-3-butyne 1.3-dimethylcyclohexane

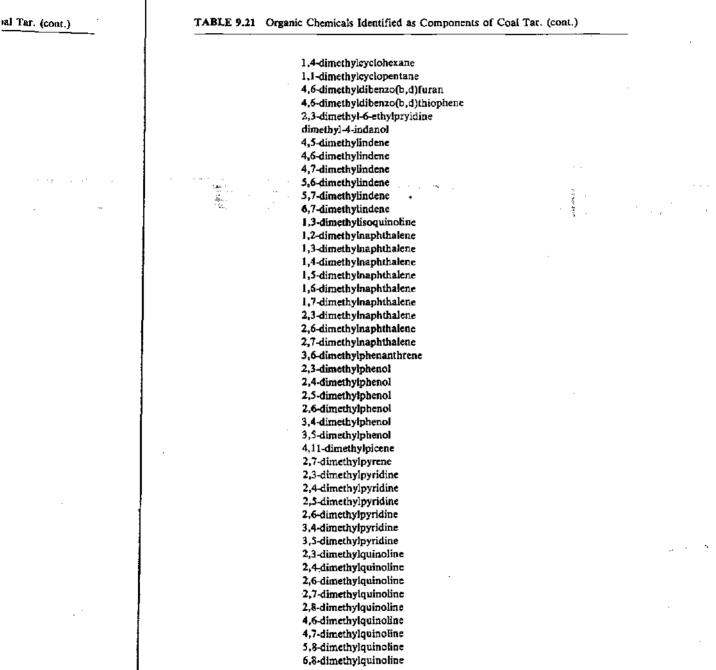


TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar. (cont.)

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dimethylsulfide 2,5-dimethylthiophene 3,5-dimethylxanthene dinaphthofuran dinaphtho(2,1-b:1',2'-d)thiophene

eicosane ethanethiol ethanol ethylbenzene ethylene glycol ethylisocyanide 2-ethyinaphthalene 3-ethylpentane 2-ethylphenol 3-ethylphenol 4-ethylphenol 2-ethylpyridine 3-ethylpyridine 4-ethylpyridine 2-ethyltoluene 3-ethyltoluene 4-ethyltoluene

fluoranthene fluorene 9H-fluorene 9H-fluorene-2-carbonitrile 2-fluorenol heptadecane n-heptane I-heptene hexadecane hexadecanoic acid hexamethylbiphenyl n-hexane I-hexene I-hexyne 2-hexyne 3-hexyne hydroxyanthracene hydroxybenzofluorene 2-hydroxybenzoic acid 3-hydroxybenzoic acid



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TABLE 9.21 Organic Chemicals Identified as Components of Coai Tar. (cont.)

4-hydroxybenzoic acid 2-hydroxybiphenyl 9-hydroxy-4-methylfluorene 5-hydroxy-1-methyl-3-isopropylbenzene 2-hydroxy-7-methylquinoline 2-hydroxyphenanthrene 4-hydroxyphenanthrene 2-bydroxypropanoic acid 4-hydroxythionaphthene 6-hydroxythionaphthene

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a.)

- indano(2,1-a)indan 4-indanol 5-indanol indene indenofluoranthene indenole indeno(1,2,3-cd)pyrene 11H-indeno(1,2-b)quinoline indole 6H-indelo(2,3-b)quinoline 2-isopropylphenol 3-isopropylphenol 4-isopropylphenol isoquinoline
- methanethiol 4-methoxybenzophenone methylacenaphthene methylacenaphthylene methylacenaphthol methylacetylene 2-methylacridine methylaminoacenaphthylene 2-methylaniline 3-methylaniline 4-methylaniline 1-methylanthracene 2-methylanthracene 9-methylanthracene methylbenzindole 1-methylbenzo(a)anthracene 6-methylbenzo(a)anthracene 9-methylbenzo(a)anthracene

TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar. (cont.)

l I-methylbenzo(a)anthracene methylbenzofluoranthene methylbenzofluoreneamine 2-methylbenzofuran 4-methylbenzo(b)furan 5-methylbenzo(b)furan 6-methylbenzo(b)furan 7-methylbenzo(b)furan methylbenzo(n)naphtho(2,3-d)furan 3-methylbenzo(f)quinoline 2-methylbenzo(b)thiophene 3-methylbenzo(b)thiophene 2-methylbiphenyl 3-methylbiphenyl 4-methylbiphenyl 2-methyl-1,3-butadiene 2-methyl-2,3-butadiene 2-methyl-3-butyne N-methylcarbazole 2-methylcarbazole 3-methylcarbazole 1-methylchrysene 6-methylchrysene methylcyclohexane methylcyclopentane methylcyclopenteno(dc)cinnoline 2-methyldibenzo(b,d)furan 3-methyldibenzo(b,d)furan 4-methyldibenzo(b,d)furan 2-methyldibenzothiophene 4-methyldibenzothiophene 1,1'-methylenebisbenzene 1-methyl-4-ethylbenzene 3-methyl-3-ethylpentane 2-methyl-3-ethylphenol 2-methyl-4-ethylphenol 2-methyl-5-ethylphenol 3-methyl-4-ethylphenol 3-methyl-5-ethylphenol 3-methyl-6-ethylphenol 4-methyl-2-ethylphenol 4-methyl-3-ethylphenol 1-methyl-1-ethyl-2-phenyl-2-tolylethylene 2-methyl-4-ethylpyridine i-methylfluorene 2-methylfluorene

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TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar. (cont.)

3-methylfluorene 4-methylfluorene 9-methylfluorene 2-methyl-9H-carbazole 1-methyl-9H-fluorene 2-methyl-9H-fluorene 9-methyl-9H-fluorene 2-methylheptane 3-methylheptane 3-methylhexane 4-methylindan 1-methyl-5-indanol 3-methyl-4-indanol 3-methyl-5-indanol 4-methyl-5-indanol 5-methyl-4-indanol 6-methyl-4-indanol 6-methyl-5-indanol 7-methyl-4-indanol 7-methyl-5-indanol 4-methylindene 2-methylindole 3-methylindole 4-methylindole 5-methylindole 7-methylindole methylisocyanide 1-methyl-2-isopropenylbenzene 1-methyl-4-isopropylbenzene 1-methylisoquinoline 3-methylisoquinoline 5-methylisoquinoline 6-methylisoquinoline 7-methylisoquinoline 8-methylisoquinoline 1-methylnaphthalene 2-methyinaphthalene 3-methyl-2-naphthol 3-methylnonane 4-methylnonane 3-methyloctane 2-methylpentane methylphenanthracene 1-methylphenanthrene 2-methylphenanthrene 3-methylphenanthrene 9-methylphenanthrene methylphenylnaphthalene

ul Tar. (cont.)

TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar. (cont.)

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| | methyltriphenylene | |
| | 1-methyl-2-vinylbenzene | |
| | I-methyl-4-vinylbenzene | |
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| | naphthalene | |
| | naphtho(1,2-b)chrysene | |
| | 2',1':1,2-naphthofluorene | |
| | naphtho(1,2-b)furan | |
| | | |
| | naphtho(2,1-b)furan | |
| | naphthoindole | |
| | I-naphthol | |
| | 2-naphthol | |
| | naphtho(1,2-a)pyrene | |
| | naphthopyrrole | |
| | naphtho(1,2-b)thiophene | |
| | naphtho(2,1-b)thiophene | |
| | naphtho(2,3-b)thiophene | |
| | naphtho(2,1,8,7-kimn)xanthene | |
| | | |
| | o-(2-naphthyl)-phenol | |
| | nonadecane | |
| | nonane | \frown |
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Tar. (cont.)

TABLE 9.21 Organic Chemicals Identified as Components of Coal Tar. (cont.)

octadecane octadecanoic acid cis-9-octadecenoic acid octahydroanthracene n-octane 5-oxo-4,5-dihydro-4-azapyrene

pentacene 1,3-pentadiene n-pentane pentanoic acid pentaphene I-pentene 2-pentene 1-pentyne 2-pentyne perylene phenanthrene phenanthridine 5H-phenanthridin-6-one phenanthrobenzpyrene phenanthro(4,5-bcd)thiophene phenol 1-phenylbenzanthrone 2-phenylbutane 1-phenylnaphthalene 2-phenylnaphthalene 2-phenylphenanthrene 1-phenylpropane 2-phenylpropane 1-phenyl-1-propanone 2-phenylpyridine 4-phenylpyridine phthalate esters phthalic esters phytane picene pristane propadiene propanoic acid propionamide 2-n-propylphenol 3-n-propylphenol 4-n-propylphenol pyrene