Emissions from candles / incense

Chemical	Group	Study or Reference	category	emission factor	Emission rate*	Unit
1,2,3,7,8-PeCDD	polychlorinated dibenzodioxins PCDD	Petry et al. (2014) **TC** [89]	Scented candles		<24.7[1]	pg/h
			Unscented candles		<22.4[1]	pg/h
2,3,4,7,8-PeCDF	polychlorinated dibenzofurans PCDF)		Scented candles		<31.4[1]	pg/h
			Unscented candles		<28.5[1]	pg/h
2,3,7,8-TCDD	Benzodioxins		Scented candles		<36.8[1]	pg/h
			Unscented candles		<35[1]	pg/h
Acenaphthene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	1.47±1.45 (0.15±0.01, 5.99±5.10)[2]		ng/g
Acenaphthylene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	0.68±0.06 (0.51±0.06, 1.50±0.13) [2]		ng/g
Anthracene	PAH	Derudi et al. (2012) **TC** [90]	Scented candles	0.02[1]		ng/g
		Derudi et al. (2014) **TC** [91]	Unscented Candles	8.72±8.70 (3.12±2.62, 10.2±0.77) [2]		ng/g
Benzo[g,h,i]perylene	PAH	Petry et al. (2014) **TC** [89]	Scented candles		<0.21[1]	µg/h
			Unscented candles		<0.21[1]	µg/h
Benzo[g,h,i]perylene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	<0.01[1]		ng/g
Benzo[k,f]fluoranthene	PAH	Petry et al. (2014) **TC** [89]	Scented candles		<0.21[1]	µg/h
			Unscented candles		<0.21[1]	µg/h
Benzo[k]fluoranthene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	3.50±3.49 (<0.01,		ng/g

Chemical	Group	Study or Reference	category	emission factor	Emission rate*	Unit
				3.78±2.83) [2]		
Carcinogenic PAHs	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	5.19 (0.1, 10.9) [2]		ng/g
DEP	Phthalates	Manoukain et al. (2016) **TC** [88]	Incense	88, 11240[3]		µg/g
Fluoranthene	PAH	Derudi et al. (2012) **TC** [90]	Scented candles	0.07[1]		ng/g
Fluoranthene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	0.13±0.12 (0.09±0.08, 0.23±0.22) [2]		ng/g
Fluorene	PAH	Derudi et al. (2012) **TC** [90]	Scented candles	0.04[1]		ng/g
Fluorene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	0.43±0.34 (0.06±0.05, 6.09±5.16) [2]		ng/g
Ideno[1,2,3-cd]pyrene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	<0.01[1]		ng/g
Ideno[1,2,3-cd]pyrene	PAH	Petry et al. (2014) **TC** [89]	Scented candles		<0.21[1]	µg/h
			Unscented candles		<0.21[1]	µg/h
Phenanthrene	PAH	Derudi et al. (2012) **TC** [90]	Scented candles	0.14[1]		ng/g
Phenanthrene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	4.19±3.06 (0.77±0.27, 6.04±1.91) [2]		ng/g

Chemical	Group	Study or Reference	category	emission factor	Emission rate*	Unit
Pyrene	PAH	Derudi et al. (2012) **TC** [90]	Scented candles	0.1[1]		ng/g
Pyrene	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	<0.01 (<0.1, 0.23±0.22) [2]		ng/g
total PAHs	PAH	Derudi et al. (2014) **TC** [91]	Unscented Candles	83.6 (26.6, 152) [2]		ng/g

*Emission rate: emitted mass per unit time **emission factor: emitted mass per unit weight, volume, distance or duration

EH: experimental house; **TC:** test chamber or cell; **MEC**: Miniature Emissions Chamber ; [1]: sample value [2]: medium (minimum, maximum) [3]: minimum, maximum

<u>Emissions from electronics / consumer products</u>

Chemical	Group	Author	Category/Item	Area specific emission rates (SERa)	Area specific emission rates (SERab)	Unit specific emission rates (SERu)	Unit
BDE100	Flame retardant (brominated)	Kemmlein et al. (2003) **GD** [92]	Television set housing	0.5[1]			ng/m2h
			Printed circuit board			1.3[1]	$ngunit^{-1}h\text{-}1$
BDE153			Television set housing	1[1]			ng/m2h

Chemical	Group	Author	Category/Item	Area specific emission rates (SERa)	Area specific emission rates (SERab)	Unit specific emission rates (SERu)	Unit
	Flame retardant (brominated)	Kemmlein et al. (2003) **GD** [92]	Printed circuit board			0.04[1]	ngunit^{-1}h-1
BDE154	Flame retardant (brominated)	Kemmlein et al. (2003) **GD** [92]	Television set housing	0.2[1]			ng/m2h
			Printed circuit board			0.1[1]	ngunit^{-1}h-1
			~~Printed circuit board~~			~~14.2[1]~~	~~ngunit^{-1}h-1~~
BDE66	Flame retardant (brominated)	Kemmlein et al. (2003) **GD** [92]	Television set housing	0.5[1]			ng/m2h
			Printed circuit board			0.4[1]	ngunit^{-1}h-1
BDE85	Flame retardant (brominated)	Kemmlein et al. (2003) **GD** [92]	Printed circuit board			0.1[1]	ngunit^{-1}h-1
heptaBDE (BDE-171, BDE-180, BDE-183)	Flame retardant (brominated)	Kemmlein et al. (2003) **GD** [92]	Television set housing	4.5[1]			ng/m2h
TCPP	Flame retardant (organophosphate)	Kemmlein et al. (2003) [92]	Upholstery stool **GC**	28[1]	36[1]		µg/m2h
			Mattress **TC**		0.012[1]		µg/m2h
			Upholstery foam **TC**		77[1]		µg/m2h

TC: test chamber or cell; **GC**: glass cell; **GD**: glass desiccator; [1]: sample value

Emissions from Building Materials

Chemical	Group	Author	building materials	Emission rate	Area specific emission rates (SERa)*	Area specific emission rates (SERab)*	duration	Unit
Acypetacs	wood preservative/fungicide	Yu et al. (2009) **MC** [94]	Pine coated with acypetacs zinc and permethrin	553[6]			3-10 days	µg/m2 h
				460[6]			28-34 days	µg/m2 h
DEP	phthalate	Schripp et al. (2014) **TC / EC** [93]	Paint - latex F2	407[6]			5 days	µg/m2 h
			Paint - latex F1	579[6]			5 days	µg/m2 h
			Paint - latex F1 (LC)	601.6[6]			1 week	µg/m2 h
			Paint - latex F1 (LC)	780.8[6]			1 week	µg/m2 h
			Paint - latex F1 (LC)	918.4[6]			?	µg/m2 h
Dichlofluanid		Horn et al. (2003) [95]	film preservative (wood)		1.5[C, 6]			µg/m2 h
Dichlofluanid	fungicide	Yu et al. (2009) **MC** [94]	Pine coated with woodstain (teak)	<20[6]			3-10 days	ng/m2 h
			Pine coated with woodstain (teak)	<20[6]			28-34 days	ng/m2 h
			Pine coated with woodstain (teak)	<20[6]			56-61 days	ng/m2 h
			Pine coated with woodstain (teak)	<20[6]			79-90 days	ng/m2 h
flurox	Herbicide	Yu et al. (2009)	Pine coated with quick dry formulation	1[6]			3-10 days	µg/m2 h

Chemical	Group	Author	building materials	Emission rate	Area specific emission rates (SERa)*	Area specific emission rates (SERab)*	duration	Unit
		MC [94]	Pine coated with quick dry formulation	7[6]			28-34 days	µg/m2 h
			Pine coated with quick dry formulation	6[6]			56-61 days	µg/m2 h
			Pine coated with quick dry formulation	<2[6]			79-90 days	µg/m2 h
IPBC (iodopropinylbutylcarbamate)		Horn et al. (2003) [95]	film preservative (wood)		1.7[C,6]			µg/m2 h
			masonry preservative - ceramic tile		1[C, 6]			µg/m2 h
OIT (n-octyl-4-isothiazolin-3-one)		Horn et al. (2003) [95]	fibre, leather, rubber, and polyermisd material preservatives (foil)		2.5[C, 6]			µg/m2 h
Propiconazole	triazole fungicide	Yu et al. (2009) **MC** [94]	Scots pine pretreated with solvent based wood preservative	54[6]			3-10 days	ng/m2 h
			Scots pine pretreated with solvent based wood preservative	63[6]			28-34 days	ng/m2 h
			Scots pine pretreated with solvent based wood preservative	45[6]			56-61 days	ng/m2 h
			Scots pine pretreated with solvent based wood preservative	45[6]			79-90 days	ng/m2 h

Chemical	Group	Author	building materials	Emission rate	Area specific emission rates (SERa)*	Area specific emission rates (SERab)*	duration	Unit
			Scots pine pretreated with water based wood preservative	27[6]			3-10 days	ng/m2 h
			Scots pine pretreated with water based wood preservative	27[6]			28-34 days	ng/m2 h
			Scots pine pretreated with water based wood preservative	33[6]			56-61 days	ng/m2 h
			Scots pine pretreated with water based wood preservative	27[6]			79-90 days	ng/m2 h
			Spruce pretreated with solvent based wood preservative	108[6]			3-10 days	ng/m2 h
			Spruce pretreated with solvent based wood preservative	144[6]			28-34 days	ng/m2 h
			Spruce pretreated with solvent based wood preservative	85[6]			56-61 days	ng/m2 h
			Spruce pretreated with solvent based wood preservative	90[6]			79-90 days	ng/m2 h
			Spruce pretreated with water based wood preservative	<18[6]			3-10 days	ng/m2 h

Chemical	Group	Author	building materials	Emission rate	Area specific emission rates (SERa)*	Area specific emission rates (SERab)*	duration	Unit
			Spruce pretreated with water based wood preservative	18[6]			28-34 days	ng/m2 h
			Spruce pretreated with water based wood preservative	20[6]			56-61 days	ng/m2 h
			Spruce pretreated with water based wood preservative	<18[6]			79-90 days	ng/m2 h
			Untreated Scots pine	<18[6]			3-10 days	ng/m2 h
			Untreated Scots pine	<15[6]			28-34 days	ng/m2 h
			Untreated Scots pine	<18[6]			56-61 days	ng/m2 h
			Untreated Scots pine	<18[6]			79-90 days	ng/m2 h
			Untreated spruce	<17[6]			3-10 days	ng/m2 h
			Untreated spruce	<15[6]			28-34 days	ng/m2 h
			Untreated spruce	<18[6]			56-61 days	ng/m2 h
			Untreated spruce	<18[6]			79-90 days	ng/m2 h
			Pine coated with quick dry formulation	<18[6]			3-10 days	ng/m2 h

Chemical	Group	Author	building materials	Emission rate	Area specific emission rates (SERa)*	Area specific emission rates (SERab)*	duration	Unit
			Pine coated with quick dry formulation	<18[6]			28-34 days	ng/m2 h
			Pine coated with quick dry formulation	<18[6]			56-61 days	ng/m2 h
			Pine coated with quick dry formulation	<18[6]			79-90 days	ng/m2 h
Propiconazole		Horn et al. (2003) [95]	film preservative (wood)		0.02[C, 6]			µg/m2 h
			wood preservative		0.2[C, 6]			µg/m2 h
TCPP	Flame retardant (organophosphate)	Kemmlein et al. (2003) [92]	Insulating boards (80g/L)[3] **GD**		0.35[6]	0.21[6]		µg/m2 h
			Assembly foam (rough, new)[4] **GD**			70[6]		µg/m2 h
			Assembly foam (smooth, new)[5] **GD**			50[6]		µg/m2 h
			Insulating boards (30g/L)[3] **GD**		0.7[6]	0.6[6]		µg/m2 h
			Assembly foam (rough, stored)[4] **GD**		130[6]	140[6]		µg/m2 h
			Assembly foam (smooth, stored)[5] **GD**		70[6]	50[6]		µg/m2 h
Tebuconazole	triazole fungicide	Yu et al. (2009) **MC** [94]	Scots pine pretreated with solvent based wood preservative	18[6]			3-10 days	ng/m2 h

Chemical	Group	Author	building materials	Emission rate	Area specific emission rates (SERa)*	Area specific emission rates (SERab)*	duration	Unit
			Scots pine pretreated with solvent based wood preservative	27[6]			28-34 days	ng/m2 h
			Scots pine pretreated with solvent based wood preservative	27[6]			56-61 days	ng/m2 h
			Scots pine pretreated with solvent based wood preservative	27[6]			79-90 days	ng/m2 h
			Scots pine pretreated with water based wood preservative	18[6]			3-10 days	ng/m2 h
			Scots pine pretreated with water based wood preservative	18[6]			28-34 days	ng/m2 h
			Scots pine pretreated with water based wood preservative	20[6]			56-61 days	ng/m2 h
			Scots pine pretreated with water based wood preservative	18[6]			79-90 days	ng/m2 h
			Spruce pretreated with solvent based wood preservative	45[6]			3-10 days	ng/m2 h
			Spruce pretreated with solvent based wood preservative	48[6]			28-34 days	ng/m2 h

Chemical	Group	Author	building materials	Emission rate	Area specific emission rates (SERa)*	Area specific emission rates (SERab)*	duration	Unit
			Spruce pretreated with solvent based wood preservative	27[6]			56-61 days	ng/m2 h
			Spruce pretreated with solvent based wood preservative	27[6]			79-90 days	ng/m2 h
			Spruce pretreated with water based wood preservative	<18[6]			3-10 days	ng/m2 h
			Spruce pretreated with water based wood preservative	18[6]			28-34 days	ng/m2 h
			Spruce pretreated with water based wood preservative	20[6]			56-61 days	ng/m2 h
			Spruce pretreated with water based wood preservative	<18[6]			79-90 days	ng/m2 h
			Untreated Scots pine	<18[6]			3-10 days	ng/m2 h
			Untreated Scots pine	<15[6]			28-34 days	ng/m2 h
			Untreated Scots pine	<18[6]			56-61 days	ng/m2 h
			Untreated Scots pine	<18[6]			79-90 days	ng/m2 h

Chemical	Group	Author	building materials	Emission rate	Area specific emission rates (SERa)*	Area specific emission rates (SERab)*	duration	Unit
			Untreated spruce	<17[6]			3-10 days	ng/m2 h
			Untreated spruce	<15[6]			28-34 days	ng/m2 h
			Untreated spruce	<18[6]			56-61 days	ng/m2 h
			Untreated spruce	<18[6]			79-90 days	ng/m2 h
Tolylfluanid	Biocide	Horn et al. (2003) [95]	film preservative (wood)		1.2[C, 6]			µg/m2 h

[1]Expandable polystyrene (EPS) insulating board [2]Extruded polystyrene (XPS) insulating board [3]Polyisocyanurate insulating boards (PIR) [4]One-component PU foam (1_C assembly foam) in cartridges, rough surface. [5]One-component PU foam (1_C assembly foam) in cartridges, smooth surface; [6]: sample value; **MC:** microchamber **EC**: exposure chamber **TC:** test chamber or cell; **GC**: glass cell; **GD**: glass desiccator *Area specific emission rates (SER_a^a) vs Area specific emissions rates (SER_a^b): a Calculated from: $m_{tot}/(t_{tot} \times A)$; mtot(µg): integrated emission concentration + total mass on chamber walls; ttot(h): total test period; A(m2): sample surface area. b Calculated from: ceq x q; ceq($\mu g m^{-3}$): estimated equilibrium concentration; q ($m^3 m^{-2} h^{-1}$): area-specific air flow rate. [C]: SER_a=Cq (c= concentration, q= area specific flow rate