



2.B.6 - Titanium Dioxide Production

Short description

Category Code	Method					AD					EF				
2.B.6	T3					C					C				
	NO _x	NM VOC	SO ₂	NH ₃	PM _{2.5}	PM ₁₀	TSP	BC	CO	Pb	Cd	Hg	Diox	PAH	HCB
Key Category:	-/-	-	-/-	-	-	-	-/-	-	-/-	-	-	-	-	-	-

T = key source by Trend **L** = key source by Level

Methods	
D	Default
RA	Reference Approach
T1	Tier 1 / Simple Methodology *
T2	Tier 2*
T3	Tier 3 / Detailed Methodology *
C	CORINAIR
CS	Country Specific
M	Model

* as described in the EMEP/CORINAIR Emission Inventory Guidebook - 2007, in the group specific chapters.

AD - Data Source for Activity Data	
NS	National Statistics
RS	Regional Statistics
IS	International Statistics
PS	Plant Specific data
AS	Associations, business organisations
Q	specific questionnaires, surveys

EF - Emission Factors	
D	Default (EMEP Guidebook)
C	Confidential
CS	Country Specific
PS	Plant Specific data

In *NFR 2.B.6*, SO₂, CO, NO_x and TSP emissions from the production of titanium dioxide are reported.

Method

Activity Data

There are two kinds of processes called chloride process and sulfate process for the production of titanium dioxide. The total production amount is attained from the German Federal Statistical Office¹⁾.

For the calculation of individual production of each process, the fraction of chloride process is determined based on the estimated total production capacity in Germany (480 kt/y) and the production capacity via chloride process (165 kt/y)²⁾³⁾.

Emission Factors

Emission factors for Titanium dioxide production are the Tier 2 emission factors from EMEP Guidebook: NO_x, CO, and TSP are provided for the chloride process, while only factors for NO_x and TSP are available for the sulfate process.

The applied Tier 2 emission factors are listed in Table 1 ⁴⁾.

Table 1: Tier 2 emission factors for Titanium dioxide production, in [kg/t]

Pollutant	Name of process	EF
CO	Chloride	159
NO _x	Chloride	0.1
TSP	Chloride	0.2
NO _x	Sulfate	0.108
TSP	Sulfate	0.3

Emissions

The association of the titanium producers reports the sum of SO₂ emissions from both processes directly to the UBA. Here, since submission 2022, these emissions are no longer confidential.

Except for SO₂, emissions of the mentioned pollutants are calculated through the multiplication of activity data and corresponding emission factors.

As the emission factors are constant over the time the emission trend is influenced only by the development of the production.

Recalculations

For SO₂ emissions from the production of **titanium dioxide** and **sulphuric acid**, estimates reported for the *second to last year* of the time series are routinely actualised by the producers. Furthermore, definite emissions for the *last year of the time series* are not yet available at the time the inventory is compiled. Here, the reported values represent a prediction and are therefore updated with each new submission as well.

As the SO₂ emissions from titanium dioxide are no longer confidential, they are reallocated from 2.B.10 to this category (see Table 2).

Furthermore, CO, NO_x and TSP emissions are reported for the first time (see also Table 2).

Table 2: Activity data and emissions for Titanium dioxide production from 1990 to 2020 ⁵⁾.

	Activity data (kt)	Emission (kt)			
		NO _x	TSP	CO	SO ₂
1990	350.00	0.04	0.09	19.48	1.73
1991	330.00	0.03	0.08	18.36	1.73
1992	317.21	0.03	0.08	17.65	1.73
1993	300.07	0.03	0.08	16.70	1.64
1994	332.36	0.03	0.08	18.50	1.74
1995	300.63	0.03	0.08	16.73	2.00
1996	405.19	0.04	0.11	22.55	1.60
1997	450.49	0.05	0.12	25.07	0.87
1998	315.41	0.03	0.08	17.55	0.67
1999	309.59	0.03	0.08	17.23	0.62
2000	407.45	0.04	0.11	22.67	0.77
2001	377.01	0.04	0.10	20.98	0.57
2002	411.57	0.04	0.11	22.90	0.71
2003	417.82	0.04	0.11	23.25	0.77

2004	439.06	0.05	0.12	24.43	0.94
2005	445.32	0.05	0.12	24.78	0.90
2006	463.24	0.05	0.12	25.78	0.86
2007	460.14	0.05	0.12	25.61	0.9
2008	452.09	0.05	0.12	25.16	1.01
2009	334.62	0.04	0.09	18.62	0.76
2010	423.29	0.04	0.11	23.56	0.70
2011	411.81	0.04	0.11	22.92	0.59
2012	367.75	0.04	0.10	20.47	0.45
2013	376.87	0.04	0.10	20.97	0.57
2014	381.26	0.04	0.10	21.22	0.54
2015	381.12	0.04	0.10	21.21	0.61
2016	391.15	0.04	0.11	21.77	0.68
2017	416.34	0.04	0.11	23.17	0.94
2018	377.69	0.04	0.10	21.02	0.94
2019	376.02	0.04	0.10	20.93	0.95
2020	338.99	0.04	0.09	18.87	0.96



For **pollutant-specific information on recalculated emission estimates for Base Year and 2019**, please see the pollutant specific recalculation tables following [chapter 8.1 - Recalculations](#).

Planned improvements

For 1990 and 1991 for reasons of confidentiality the SO_x-emissions were replaced by the emissions value from 1992. Meanwhile the confidentiality does not anymore exist. So for the next submission the real SO_x for 1990 and 1991 will be published.

^{1), 5)} Production statistics: Until 1994 GP89 - 4612 50, 1995 until 2008 GP241211500 and GP201211500 from 2009 onwards

²⁾ <https://forum-titandioxid.de/2020/03/12/sachlage-zu-titandioxid-und-titandioxidhaltigen-farben-und-lacken/>

³⁾ <https://kronostio2.com/en/manufacturing-facilities/leverkusen-germany>

⁴⁾ European Environment Agency: EMEP/EEA air pollutant emission inventory guidebook 2019, Part B: sectoral guidance chapters, 2.B Chemical industry (Oct 2019): pp.25-26, table 3.19 and table 3.20