IARC MONOGRAPHS

COBALT, ANTIMONY COMPOUNDS, AND WEAPONS-GRADE TUNGSTEN ALLOY

VOLUME 131

IARC MONOGRAPHS ON THE IDENTIFICATION OF CARCINOGENIC HAZARDS TO HUMANS

International Agency for Research on Cancer

World Health Organization

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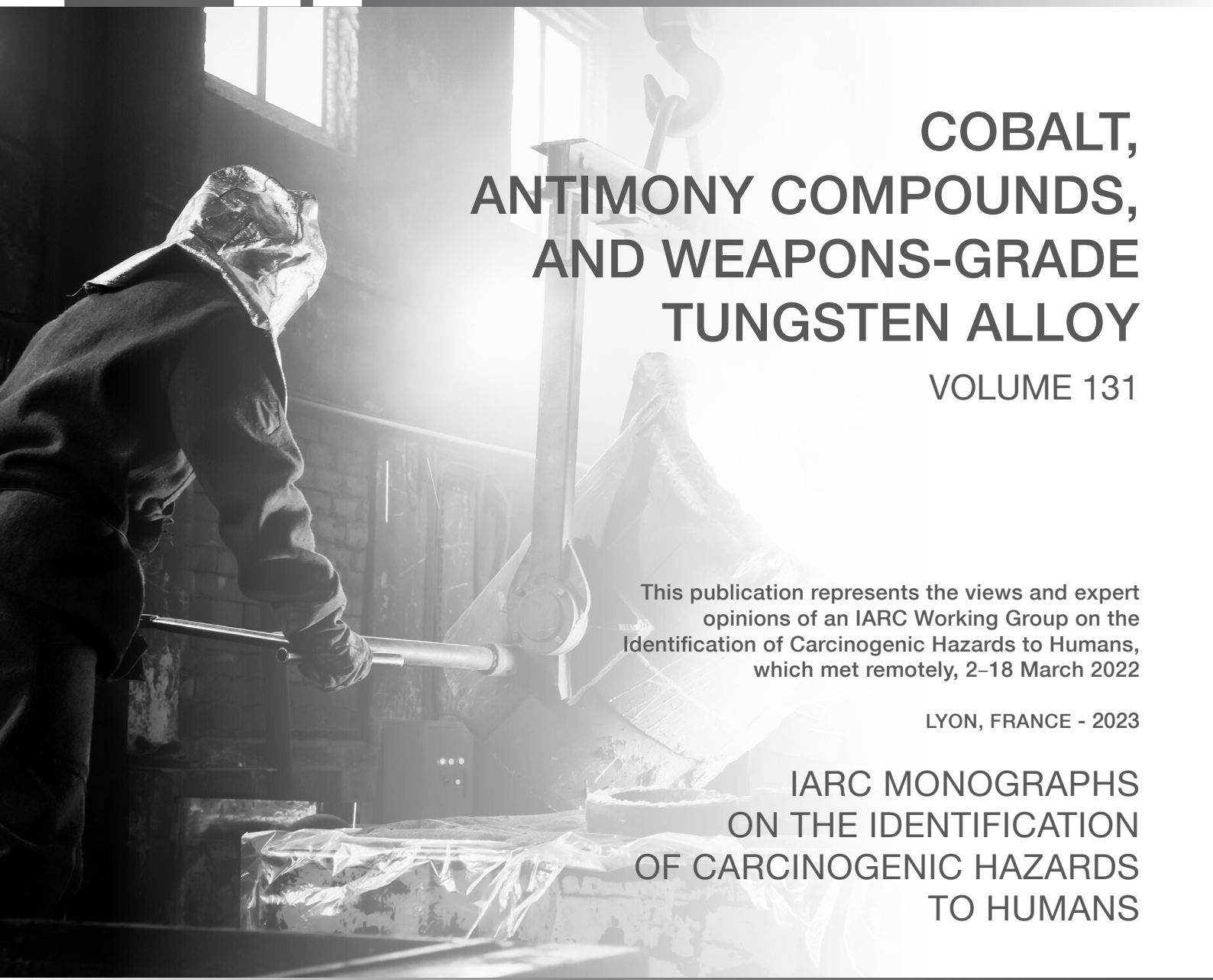

COBALT, ANTIMONY COMPOUNDS, AND WEAPONS-GRADE TUNGSTEN ALLOY

VOLUME 131

This publication represents the views and expert opinions of an IARC Working Group on the Identification of Carcinogenic Hazards to Humans, which met remotely, 2–18 March 2022

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In 1969, the International Agency for Research on Cancer (IARC) initiated a programme on the evaluation of the carcinogenic hazard of chemicals to humans, involving the production of critically evaluated monographs on individual chemicals. The programme was subsequently expanded to include evaluations of carcinogenic hazards associated with exposures to complex mixtures, lifestyle factors and biological and physical agents, as well as those in specific occupations. The objective of the programme is to elaborate and publish in the form of monographs critical reviews of data on carcinogenicity for agents to which humans are known to be exposed and on specific exposure situations; to evaluate these data in terms of cancer hazard to humans with the help of international working groups of experts in carcinogenesis and related fields; and to identify gaps in evidence. The lists of IARC evaluations are regularly updated and are available on the internet at https://monographs.iarc.who.int/.

This programme has been supported since 1982 by Cooperative Agreement U01 CA33193 with the United States National Cancer Institute, Department of Health and Human Services. Additional support has been provided since 1986 by the European Commission Directorate-General for Employment, Social Affairs, and Inclusion, initially by the Unit of Health, Safety and Hygiene at Work, and since 2014 by the European Union Programme for Employment and Social Innovation "EaSI" (for further information please consult: https://ec.europa.eu/social/easi). Support has also been provided since 1992 by the United States National Institute of Environmental Health Sciences, Department of Health and Human Services. The contents of this volume are solely the responsibility of the Working Group and do not necessarily represent the official views of the United States National Cancer Institute, the United States National Institute of Environmental Health Sciences, the United States Department of Health and Human Services, or the European Commission.

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About the cover: Workers involved in smelting processes are potentially exposed to cobalt metal and cobalt compounds, and to antimony.

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This volume of the *IARC Monographs* provides evaluations of the carcinogenicity of nine agents: cobalt metal (without tungsten carbide or other metal alloys), soluble cobalt(II) salts, cobalt(II) oxide, cobalt(II,III) oxide, cobalt(II) sulfide, other cobalt(II) compounds, trivalent antimony, pentavalent antimony, and weapons-grade tungsten (with nickel and cobalt) alloy.

Cobalt is used in the manufacture of cutting and grinding tools, in pigments, paints, coloured glass, medical implants, and electroplating, and in lithium-ion battery production. Occupational exposure is expected to occur during cobalt refining and production of cobalt compounds and dental materials, use of diamond–cobalt tools, plate painting with cobalt pigments, manufacture of nickel–hydrogen batteries, hard-metal production, and electronic-waste recycling. The general population is exposed via food, air, tobacco smoke, and medical implants.

Antimony is used in flame retardants, lead–acid batteries and alloys, plastics, brake pads, clutch discs, glass, ceramics, and as a primer in explosives. Some pentavalent antimony compounds are used to treat leishmaniasis. Workers can be exposed during smelting, manufacture of antimony compounds, glass, textiles, and batteries, and electrical-waste processing. Non-occupational exposures occur via water, air, soil, consumer products, and tobacco.

Weapons-grade tungsten (with nickel and cobalt) alloy is used in armour-penetrating munitions. Occupational exposure can occur during munitions production, and military personnel and civilians can be exposed to metal aerosols generated during firing or impact, or via injuries with retained embedded fragments.

An *IARC Monographs* Working Group reviewed evidence from cancer studies in humans (available mainly for cobalt and antimony), cancer bioassays in experimental animals, and mechanistic studies to assess the carcinogenic hazard to humans of exposure to these agents and concluded that:

- Cobalt metal (without tungsten carbide or other metal alloys), soluble cobalt(II) salts, and trivalent antimony are *probably carcinogenic to humans (Group 2A)*;
- Cobalt(II) oxide and weapons-grade tungsten (with nickel and cobalt) alloy are *possibly carcinogenic to humans (Group 2B)*;
- Cobalt(II,III) oxide, cobalt(II) sulfide, other cobalt(II) compounds, and pentavalent antimony were each evaluated as *not classifiable as to its carcinogenicity to humans (Group 3)*.

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