Comments on the draft recommendation of substances for inclusion in Annex XIV

Substance name: Boric Acid

EC Number: 233-139-2, 234-343-4

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Content

1 Introduction and viewpoint

The comments given here are explaining the view of the surface finishing industry, especially the plating industry. In this industrial branch, Boric Acid is used as fundamental component of the plating electrolytes. It is used mainly in the zinc, nickel or chrome(III) electrolytes and some minor applications like cobalt plating.

The various applications and potential risk have been widely discussed during the public consultation on the Annex XV dossiers on the identification of Boric Acid as substance of very high concern in 2010. We do not want to repeat the arguments listed in the documents of comments of ECHA and refer to the arguments given there.
The comments given here will concentrate on the open questions given in the documents of comments.

2 Use in plating industry

ZVO members stated that the most common applications of Boric Acid or borates in surface technology are:

1. Electrodeposition of nickel layers (gloss, semi-gloss, matt, microporous)
2. Electrodeposition of zinc layers
3. Electrodeposition of chrome layers based on trivalent chrome salts (Cr^{3+})
4. Electrodeposition of zinc-nickel layers
5. Degreaser and cleaner formulations in the pre-treatment of goods before plating
6. Electroless deposition of nickel phosphorous layers
7. Electrodeposition of tin layers
8. Electrodeposition of cobalt layers
9. Electrodeposition of gold layers
10. Direct metallisation

3 Importance for electroplating

The importance of Boric Acid for electroplating is very high. It is the most common, easy to use, readily available and most economical pH-buffer for electrolytes and in several applications not replaceable.
Electrolytes which are aimed to replace electrolytes based on chrome(VI) compounds in some applications are build up upon chrome(III) salts with Boric Acid is an essential and now unreplaceable additive.

The uses mentioned above are crucial in several industries like automotive, aerospace, consumer, electronic, photovoltaic, medicine or engineering. In the chrome(VI) replacement strategy in the electroplating application it is an indispensable component.

4 Risk potential

On page 3 of the comments /3/ it is pointed out that
"Prior to the preparation of the Annex XV dossier, the BAuA made a brief investigation concerning the exposure of workers towards Boric Acid. Neither the transitional dossier nor the literature publicly available gave measurements on Boric Acid in the air. Therefore, the airborne concentration of Boric Acid at workplaces was estimated using the EASE-Model which tends to overestimate exposure. Solely in the case of load up of ships (EASE: typically 4.81 mg B/m^3) as well as cleaning procedures (EASE: typically 1.75 mg B/m^3, especially when swept up) the EASE estimates indicated higher concentrations." /3/
Based on this comment, companies of VECCO carried out measurements of the exposition of Boric Acid. This process is ongoing.

First results show concentrations less than 0.0014 mg/m^3 Boric Acid (< 0.25 µg/m^3 Boron).
Comparing this value with the *"Technische Regeln für Gefahrstoffe und Arbeitsplatzgrenzwerte" /6, 7/ it should be noted* that the value is less than the natural concentration:
"Die natürliche, d. h. auf die Aufnahme von Bor mit der Nahrung und dem Trinkwasser zurückgehende Borkonzentration im Körper liegt bei <1 µg/ml im Blutplasma, <3 µg/ml im Urin und <8 µg/ml in Geweben (Greim, 1996)".
It has to be noted, that this value is much less than the legal occupational exposure limit value of 0.5 mg/m^3 Boron /6/.

Concerning the studies cited in the Annex XV document, it has to be taken into account that all experiments are carried out with concentrations of Boron more than 0.5 mg/m^3.

The relevance of concentrations below 1 mg/m^3 is presented in the German TRGS 900 /7/. It characterizes the relevance of concentrations below 1 mg/m^3 as follows:
"Die Autoren berichten bei Borsäure (10 mg/m^3) eine ähnlich deutliche empfundene Reizwirkung wie bei 10 mg Na-Borat-Pentahydrat/ m^3 (nur geringfügig und nicht signifikant leichtere Effektstärke) und beschreiben eine flache Dosis/Wirkungskurve, d.h., die niedrigeren Konzentrationen (2,5 und 5 mg/m^3) führten zu nur wenig reduzierter Wirkung, wobei insgesamt die Wirkung als leicht beschrieben wird."

Taking into account the long-termed exposition the document comes to the conclusion that the absolute value of NOAEL (No Observed Adverse Effect Level) is arguable based on the cited studies but always above 1 mg/m^3. This outcome is also confirmed in the ANNEX XV dossier /2/.

These values have been adopted and also confirmed by the *German Berufsgenossenschaft DGUV /4/*:
"Wenn der AGW von 2,6 mg Borsäure/m^3 eingehalten wird, sind Tätigkeiten mit Borsäure und mit borsäure-haltigen Zubereitungen / Gemischen ohne erhöhtes Gesundheitsrisiko möglich".
It has to be stressed, that the German authorities, who prepared the Annex XV dossier commonly relies on the DGUV data particularly (e.g. in the case of Chromium trioxide) as they are the only one available in practice. Therefore, the data of the German Berufsgenossenschaften should be taken into account even more.

In summary, it can be concluded from the official data of easy access that no risk has to be considered in the plating industry due the exposition of Boric Acid.
The measured value of the companies of less than 0.25 µg/m^3 Boron measured by VECCO is comparable to the amount of uptake of Boron with the natural resources.

5 Scoring

In the Background Document for Boric Acid /1/, the scope of authorization includes only industrial uses and professional uses. The direct contact to the consumer is not the scope. The background for this presentation is not understandable.

The document points out that *"... most of them (industrial uses) don't imply only formulation, but also end uses in the scope of authorization (including mixtures ≥SCL)."*

Therefore, the view should be divided in the *"...use as a processing aid ..."* when no direct contact is given and the *" ... uses of mixtures, incorporation into articles, ..."*. Furthermore, the use of Boric Acid should not be limited to the industrial use to get an overall and reliable evaluation.

6 Controllability of risk

In already existing and operating plants, a possible risk is well controlled. Significant exposures to workers are improbable due to exhaustion over the active baths or encapsulation of the plant. Boric acid exposure may only take place where it is handled as granules or powder like during the dosage.

7 Cross-connections to evaluation of other substances

The processes applied in the plating industry are based on complex processes using various chemical substances. It is necessary to take into account that the prioritisation of one substance has strong impact on the overall process. This comprises currently used processes as well as the development of new process using substances with lower risks.
This is particularly important given the background of the discussion on the development of chrome(III) electrolytes to exchange chrome(VI)-trioxide since these electrolytes require Boric Acid.
This practical example demonstrates the necessity to take into account the cross-connections of chemical substances as well as the technical and industrial background of the overall process.
The use of Boric Acid is just one example of this situation but it illustrates the complexity of the process quite well.

We are afraid that a view on an individual substance could prevent the development of new systems due to the unpredictability of the prioritisation process.
It has to be pointed out that the comprehensive view is already subject of the application of an admission to operation of the companies.

It seems to us, that this can end up in a meshwork of contradictions. We would like to focus EU commission and ECHA`s awareness on these problems. We are afraid that prioritisation restricted to substance's properties will not realise REACh's purpose. Article 58 (2) indicates, that there has to be a deep survey about regulations already existing and we do not see this aspect properly considered:
"Verwendungen oder Verwendungskategorien können von der Zulassungspflicht ausgenommen werden, sofern - auf der Grundlage bestehender spezifischer Rechtsvorschriften der Gemeinschaft mit Mindestanforderungen an den Schutz der menschlichen Gesundheit oder der Umwelt bei der Verwendung des Stoffes - das Risiko ausreichend beherrscht wird. Bei der Festlegung derartiger Ausnahmen ist insbesondere die

Verhältnismäßigkeit des mit der Art des Stoffes verbundenen Risikos für die menschliche Gesundheit und die Umwelt zu berücksichtigen,..."

We would like to emphasize, that it has to be taken into account the effect of an authorization on other processes and substances that are in discussion regarding Annex XIV. This is important for cross-linked uses where the risk of one substance is compared to another. We think that such a comparison of risks can result in a conclusion that the risk of one substance can be neglectable to the risk of another. So the latter could be given exemption for the certain use when put on Annex XIV.

8 Evaluation of alternatives

For (gloss) nickel, zinc-nickel and acidic zinc electrolytes several alternatives to Boric Acid are offered by formulators. It has to be stated that depending on the application some of these replacements have a lower performance, e. g. for high throughput plating plants which are using high cathodic current densities. Further most of these products are significantly more expensive depending on the substance or substance mixture, which was highly emphasised by the platers organised in the ZVO which are mainly SMEs in a very competitive market. A broad and long term evaluation of these alternatives is in progress but by far not completed.
A variety of carboxylic acids are used in certain applications as replacement for Boric Acid. Some of these carboxylic acids are considered to cause bigger problems in wastewater treatment and a bigger environmental impact.
For the plating on plastic process Nickel is an important layer in the sequence Cu-Ni-Cr in order to obtain the required quality (e. g. corrosion resistance, hardness, gloss or temperature resistance).
For zinc-nickel electrolytes Boric Acid free methods are on the market. They reach similar properties of electrolytes with Boric Acid.
In Cr(III) electrolytes only with Boric Acid a sufficient layer formation occurs. Without Boric Acid no sufficient thickness of the chromium layer is achievable. It should be mentioned that the required thickness of the deposited chromium layer from Cr(III) electrolytes containing Boric Acid are in a range of a few tenth micrometres (normally around 0.2 microns). The Cr(III) electrolytes definitely do not work without Boric Acid.
In former times widely used buffer for zinc electrolytes is ammonium chloride. Due to problems in wastewater treatment this substance is not an option.

In summery Boric Acid is used due to its good pH-buffering and complexing capabilities what leads to an extremely reliable and constant process. Boric Acid is an essential and

cost effective additive with low risks for the workers in the electroplating technology and in several applications absolutely not replaceable.

9 Recommendation

- Due to the high difference in the amount of use the different uses should be taken into account.
- Concerning the amount of exposition the use of Boric Acid in the plating branch should be assessed as use with properly controlled risk.

Therefore, two solutions of treating Boric Acid should be combined:

1. Implementation in Annex XVII as it is already proposed in 2010 with an explicit exception of the use in plating industry. For this purpose the discussion should be referred to that of the classification of cobalt substances to Annex XVII.
2. Classification of the use of Boric Acid in the plating branch related to Article 58.2 of the REACh legislation since the exposition data show that the risk is properly controlled obviously.

10 References

1. Draft background document for Boric Acid, ECHA 1.9.2014
2. Annex XV dossier - PROPOSAL FOR IDENTIFICATION OF A SUBSTANCE AS SUBSTANCE OF VERY HIGH CONCERN (SVHC), ECHA, Version February 2010
3. COMMENTS AND RESPONSE TO COMMENTS ON ANNEX XV SVHC : PROPOSAL AND JUSTIFICATION, ECHA 25.5.2010
4. DGUV Information "Borsäure / Borhaltige KSS (Kühlschmierstoffe)", 02/2014
5. General Approach for Prioritisation of Substances of Very High Concern (SVHCs) for Inclusion in the List of Substances Subject to Authorisation, ECHA 28.5.2010
6. Technische Regeln für Gefahrstoffe Arbeitsplatzgrenzwerte - TRGS 900, Ausgabe 2006
7. Begründung zu Borsäure und Natriumborate in TRGS 900, Stand 2006
8. VERORDNUNG (EG) Nr. 1907/2006 DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 18. Dezember 2006 zur Registrierung, Bewertung, Zulassung und Beschränkung chemischer Stoffe (REACH), zur Schaffung einer Europäischen Chemikalienagentur, zur Änderung der Richtlinie 1999/45/EG und zur Aufhebung der Verordnung (EWG) Nr. 793/93 des Rates, der Verordnung (EG) Nr. 1488/94 der Kommission, der Richtlinie 76/769/EWG des Rates sowie der Richtlinien 91/155/EWG, 93/67/EWG, 93/105/EG und 2000/21/EG der Kommission