

## SAFETY OF THE USE OF NICKEL, CADMIUM AND LEAD IN JEWELLERY

Peredriy Oksana, Pakholiuk Olena

Lutsk national technical university, Lutsk, Ukraine

The use of nickel, cadmium and lead in jewellery has been chosen as the object of this article due to the fact that these metals are the common cause of various disorders in the general population. The research has shown that these metals can influence human organism even in low concentrations therefore their use in jewellery is a risk to human health, especially for children and people who are inclined to various allergic reactions.

Due to the risks which have been already listed, the restrictions of use of nickel, cadmium and lead in jewellery are necessary to provide safety for consumers all over the world. A number of the leading countries of the world have already implemented the regulations of these metals use.

The first step to control the use of nickel in European Union was the Nickel Directive which regulated the use of this metal in jewellery and other products that come into contact with the skin. The Nickel Directive imposes limits on the amount of nickel that may be released from jewellery and other products intended to come into direct and prolonged contact with the skin. These limits, known as migration limits, are:

- 0.2  $\mu\text{g}/\text{cm}^2/\text{week}$  for post assemblies which are inserted into pierced ears and other pierced parts of the human body;
- 0.5  $\mu\text{g}/\text{cm}^2/\text{week}$  for other products intended to come into direct and prolonged contact with the skin.

Since 1 June 2009, it has been subsumed into the REACH Regulation, specifically item 27 of Annex XVII to that regulation. Today EU Regulation (EC) No 1907/2006 *concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)* regulates the use of nickel, lead and cadmium. REACH addresses the production and use of chemical substances, and their potential impacts on both human health and the environment [1]. The important provisions in REACH, governing the use of chemicals in jewellery are:

- Restricted chemicals falling under Annex XVII of REACH which include: Cadmium, Chromium (VI), Lead, Nickel (migration), Polycyclic aromatic hydrocarbons (PAHs).
- Substances of very high concern (SVHCs) on the Candidate List for the purpose of:
  - Article 7(2) of REACH ‘Notification of substances in articles’;
  - Article 33 of REACH ‘Duty to communicate information on substances in articles’.

In 2011 EU Regulation (EC) No 1907/2006 REACH amended the content of cadmium: it is prohibited to use cadmium in jewellery that is manufactured after this change, the content of cadmium in already existing jewellery must not exceed 100 mg/kg.

On April 23, 2015, the European Commission amended the Annex XVII of Regulation (EC) No 1907/2006 REACH. These changes are made to prevent the risk of multiple exposures to lead and its compounds among children, especially before the age of 36 months. It is prohibited to sell products in which the mass fraction of lead exceeds 0.05%, if during using these products as intended they may be in contact with children.

A number of countries outside of the European Union, such as Serbia, Switzerland and

Turkey, have started to implement REACH-regulations or are in the process of adopting such a regulatory framework to approach a more globalized system of chemicals registration under the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). Some other non-EU countries have developed their own standards and regulations for jewellery alloys.

In the US, jewellery products intended primarily for children aged 12 years and under are regulated by the Consumer Product Safety Improvement Act of 2008 (CPSIA). Across the nation, a host of jurisdictions regulate adult and/or children's jewellery with unique specifications. There are two American standards for jewellery. ASTM F 2923 for children's jewellery and ASTM F2999 for adult jewellery.

Jewellery for China is regulated by two mandatory standards. These are:

- GB 28480 'Adornment-Provision for limit of baneful elements';
- GB 11887 'Jewellery-Fineness precious metal alloys and designation'.

According to these standards, jewellery must not contain more than 100 mg/kg of cadmium, no more than 300 mg/kg of lead for children's jewellery and no more than 1000 mg/kg of lead for other jewellery. The migration of nickel must not exceed 0.2  $\mu\text{g}/\text{cm}^2/\text{week}$  for post assemblies which are inserted into pierced ears and other pierced parts of the human body and 0.5  $\mu\text{g}/\text{cm}^2/\text{week}$  for other jewellery [2]. So the restrictions for cadmium and nickel are similar to those in European regulations although the limits for lead are much higher in comparison to EU and Canadian regulations.

Overall, it may be concluded that it is necessary to regulate the use of nickel in jewellery or at least mention its presence in the alloy in the labelling of jewellery for all age groups because of the frequent allergic reactions to this metal. The absence of cadmium and lead is mostly important for children as they are more likely to put their jewellery into their mouths. Therefore it is advisable to provide the regulations that prohibit the use of cadmium and lead in children's jewellery in order to prevent the harmful effects of constant low-level exposure of cadmium or lead that can appear throughout a whole human life. After the implementation of all the necessary regulations, it is advisable to carry out a research of their impact on the health of the population in order to prove or disprove the effectiveness of these measures.

## References

1. Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Available: <http://data.europa.eu/eli/reg/2006/1907/2014-04-10>
2. China: mandatory standards GB 28480 for jewelry comes into force. Available: <https://www.sgsgroup.com.hk/en/news/2013/09/china-mandatory-standards-gb-28480-for-jewelry>