minerv
super
toys

bio-on

World Wide Project
minerv SUPERTOYS

14 December 2015

Technical focus document in support of press release of 16 December 2015.

World wide research project minerv supertoys

minerv super toys

Foreword

The desire for a safe, sustainable future for our children has led to our commitment to the development of new materials that do not represent a risk for future generations and do not waste our planet's resources. Technological developments in the world of toys have raised new questions relating to their safety, and have made consumers aware of the safeguards that must be in place to guarantee the health of their children.

The European Community recently issued stringent legislation on the safety of toys with **Directive 2009/48/EC**, widely referred to as the **TDS (Toy Safety Directive)**, which has been implemented into the standard international procedure for the safety requirements for toys **EN 71** and implemented through local legislation by individual Member States.

In this context, **Essential Safety Requirements** have been clearly laid down in the **TDS**, in order to ensure that toys not fully complying with the **EC Directive** are not placed on the market. Firstly, it is laid down that the toys, or the chemical products they contain, must not in any way endanger the health and safety of users or third parties. The toys must not present any risk of adverse reaction to people's health following exposure to the chemical substances or compounds contained therein.
A great deal of attention is also placed on this subject in the **United States (USA)**, whose **Consumer Product Safety Commission** has published stringent regulations **(Toy Safety)** in line with the EC.

All adverse effects on both health, including long-term effects, and on safety, including all possible minor or major injuries, are therefore covered. The essential safety requirements envisage that **toys must be safe** for both direct users and third parties, i.e. parents or other carers, other children and even for strangers. Secondly, the essential safety requirements specify that toys must be safe when used **according to their intended use or any other use** imaginable, bearing in mind the typical and often unforeseeable behaviour of children. Therefore, it is not sufficient for toys to be safe solely when they are used in the way intended by the manufacturer; they must also be safe in any other possible situation.

Minerv PHA

Since 2007, Bio-on has been constructing a more sustainable future for the plastics sector, with proprietary know-how regarding the production of PHAs (polyhydroxyalkanoates), which are considered the best biopolymers by those consciously looking to the future. PHAs are plastics made 100% from renewable waste plant sources, with no competition with food supply chains, and are 100% biodegradable in a variety of environmental conditions, without dispersal of residue following biodegradation. Bio-on designed and patented the world's first fully bio-based PHAs plastic (certified since 2014 by the United States Department of Agriculture - **USDA**) and 100% naturally biodegradable in water and soil (certified since 2008 by **Vinçotte**) without the use of chemical solvents. This exceptional product is obtained through the natural fermentation of bacteria fed by by-products from the agricultural industry (no human food).

Bio-on biopolymers have extraordinary properties that adapt to the injection and extrusion methods currently in use in the plastic industry and can cover a vast range of strategic applications: biomedical, packaging, design, clothing, automotive and more.

WATER OK bio-degradable S94 VINÇOTTE

USDA CERTIFIED BIOBASED PRODUCT PRODUCT 98%

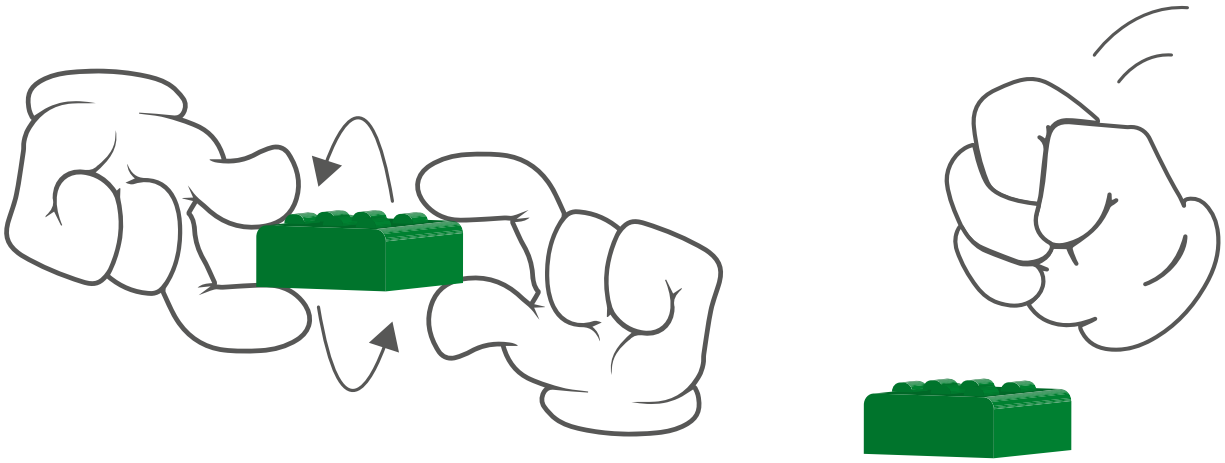
USDA

Minerv PHA supertoys

Bio-on's commitment to developing special grades of PHA entirely dedicated to toys began in **2014**, based on an awareness of the complete sustainability of its platform product called **minerv PHA**, and of its total safe use in contact with the human body, through the skin or biological fluids such as saliva and lacrimal fluid. The rigorous scientific approach that has always distinguished the development of all standard grades of **minerv PHA** by Bio-on, ensured by close scientific collaborations with polymer science and technology experts, particularly with the laboratories directed by Prof. P. Fabbri at the Department of Civil, Chemical, Environmental and Materials Engineering at the University of Bologna, has been applied in its most rigorous form yet to the **Minerv PHA Supertoys Research project**.

The first results of Bio-on's commitment to the toys sector are available from today.
The **Minerv PHA Supertoys** special grade has been created in its first formulation, completely devoid of any chemical substance prohibited or restricted by Directive 2009/48/EC. This innovative material has also been used to make the **Minerv PHA Supertoys building bricks**, *similar to LEGO bricks*, **which use extremely high quality standards and represent a major hallmark of quality in the world**.

The **Minerv PHA Supertoys** special grade contains no substances classified as carcinogenic, mutagenic or toxic for reproduction; it also contains no prohibited or restricted flavourings; the colours are made using master batches suitable for toys and contact with food.



The biocompatibility of poly(hydroxyalkanoates) was studied and confirmed several years ago, but Bio-on's determination today to develop innovative materials that pose no risk from direct use by our children has driven the **launch of this advanced research project** aimed at designing and making **minerv PHA**-based formulations specifically dedicated to the manufacture of toys and that fully meet the **Essential Safety Requirements** laid down in the **TDS**.

The ductility of the grades developed is modulated through the intrinsic properties of the Minerv PHA platform product, without the use of huge quantities of plasticizers and the complete absence of phthalates. For the first time in the world, a rigid material can also be flexible when under stress. The perception is of having two functionalities in a single type of material. A new sensation.

Toys made with the **Minerv PHA Supertoys** grade comply with all hygiene requirements because they can be repeatedly washed with hot or cold water.
The **Minerv PHA Supertoys** research and industrial development project began in 2014, and will proceed in three main areas:

1. continual improvement of **Minerv PHA Supertoys** grades, in a bid to find increasingly better properties for the toys and total safety for our children, in full compliance with **EU** regulations;

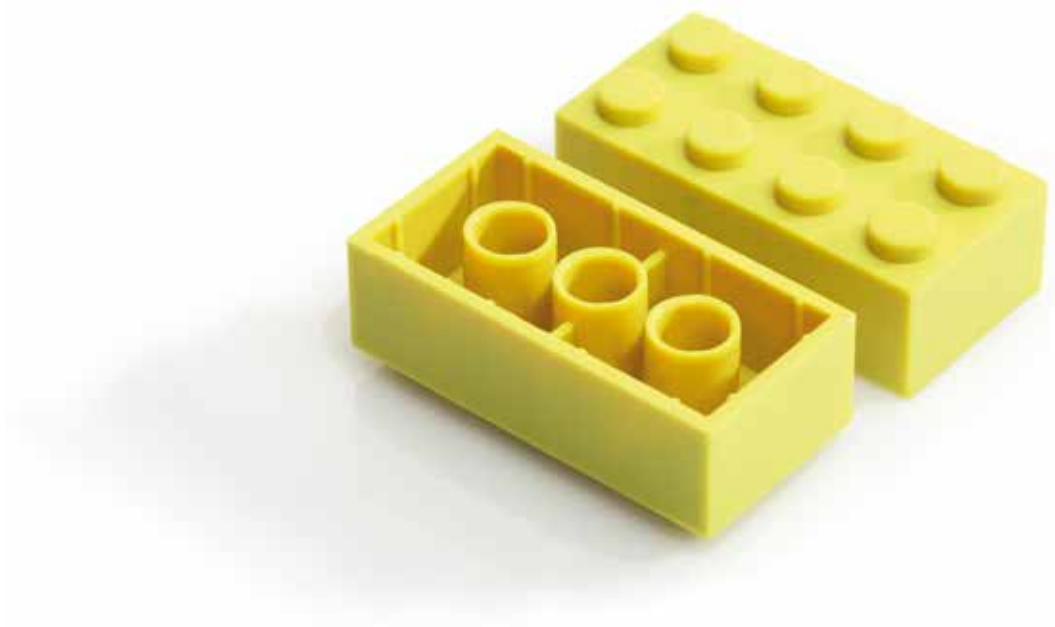
2. improvement of the processing technology of **Minerv PHA Supertoys** grades, in order to manufacture toys with increasingly advanced functional, aesthetic and precision characteristics, beginning with the considerable results always achieved thanks to the partnerships with Bio-on;

3. sharing and communication of results with the public through press releases, articles in specialist media and dedicated events.

Bio-on, the designer and Team Leader in the generation and realisation of this research project, intends to involve all companies or researchers that will have proposals to be verified and that are capable of improving the quality standard of this new platform product dedicated to toys from around the world.

The platform created by **Bio-on** for toys envisages sharing technology and coordinating objectives in order to be able to define and realise important research and development projects increasingly quickly.

The research and development phase of the **Minerv PHA Supertoys** project has no commercial goal and aims solely to demonstrate whether or not specific, eco-sustainable and completely biodegradable formulations can be created for making toys that are safe for people and the environment, without losing out on the end product's functionality and aesthetic.



Open source research team minerv PHA supertoys

Code: 15001

The project began in **2014** and is scheduled to conclude in December **2017** with the creation of 2 specific research grades of product called **minerv supertoys type "R"**, with high rigidity and strength, and **minerv supertoys type "F"**, with high flexibility and ductility.

The research and development team is an open platform and anyone able to bring experience, ideas and practical work, can contact Bio-on at the e-mail address below specifying in the subject line **"MINERVSUPERTOYS - friendly"**:

info@bio-on.it

The development platform created and coordinated by Bio-on for the **minerv PHA supertoys** research and development project currently has no commercial goal; its aim is to find innovative and revolutionary solutions in the generation of PHA-based materials for toys. With this project we wish to introduce a new development methodology that places commercial/financial aspects on a secondary level (to be considered solely at a later stage) and focuses instead on the social aspect of innovation.

Bio-ON S.p.A. is not liable for any communications regarding this report and its content and/or circulation of this report and its content, in whole or in part, by third parties.

Web links for more information on the standards governing the production of toys in Europe and the United States (USA).

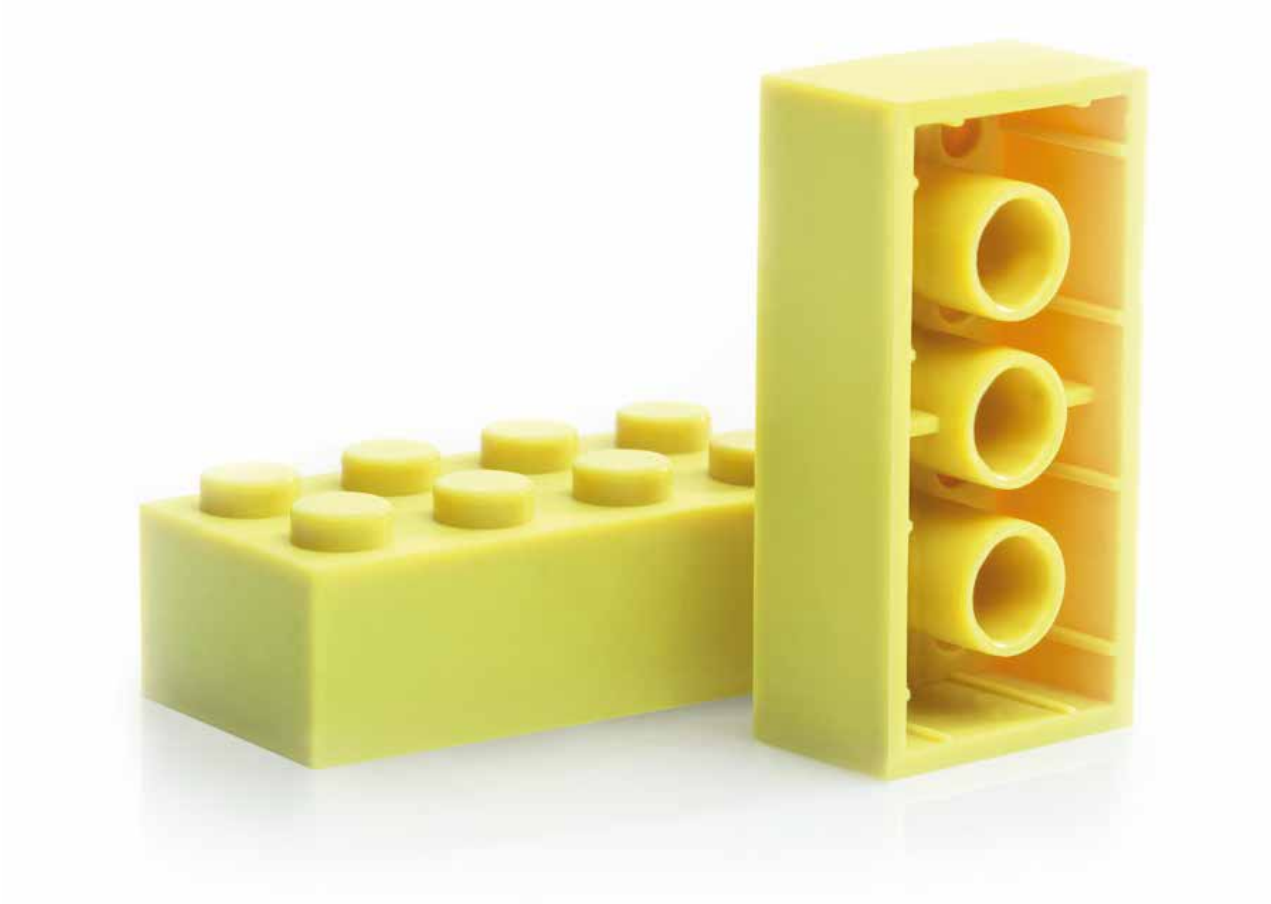
EC Directive:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:170:0001:0037:en:PDF

TDS (Toy Safety Directive)
http://ec.europa.eu/growth/sectors/toys/safety/guidance/index_en.htm

USA (Consumer Products Safety Commission)
http://www.cpsc.gov/en/Business--Manufacturing/Business-Education/Toy-Safety/

More information can be found in a directory at **www.bio-on.it**. It can be accessed from the home page. The directory contains information, videos and links, in different languages, including English (GB), German (D), French (F), Portuguese (P) and Spanish (ES).

A selection of photographs describing the development of the minerv SUPERTOYS project are shown below. The photographs are the property of Bio-on SPA and may be shared for specific purposes on request. Each photograph has a code.



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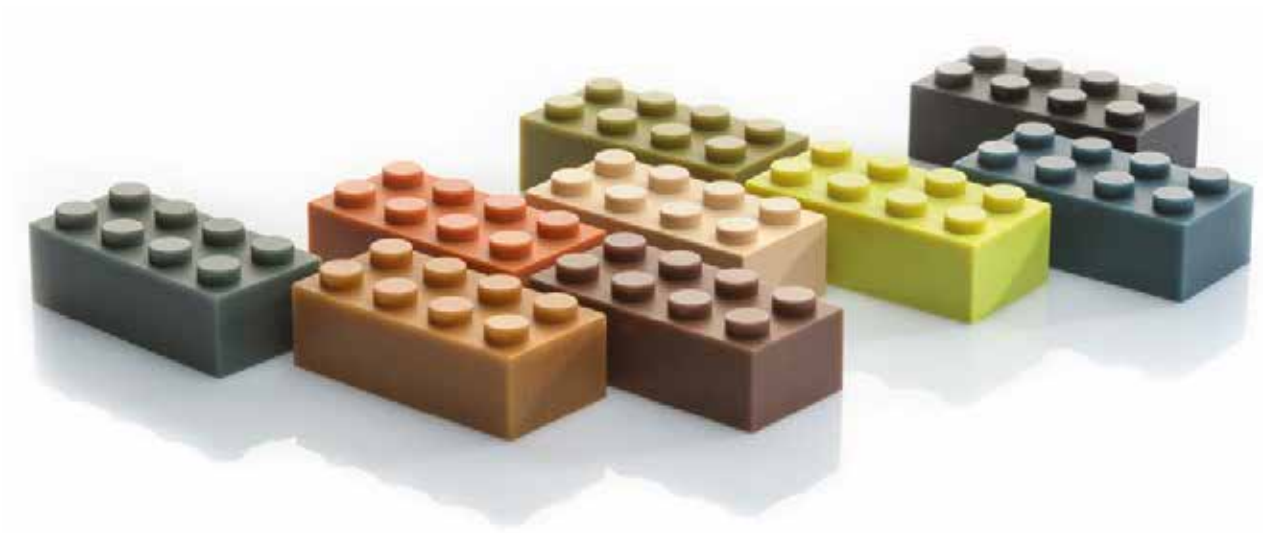

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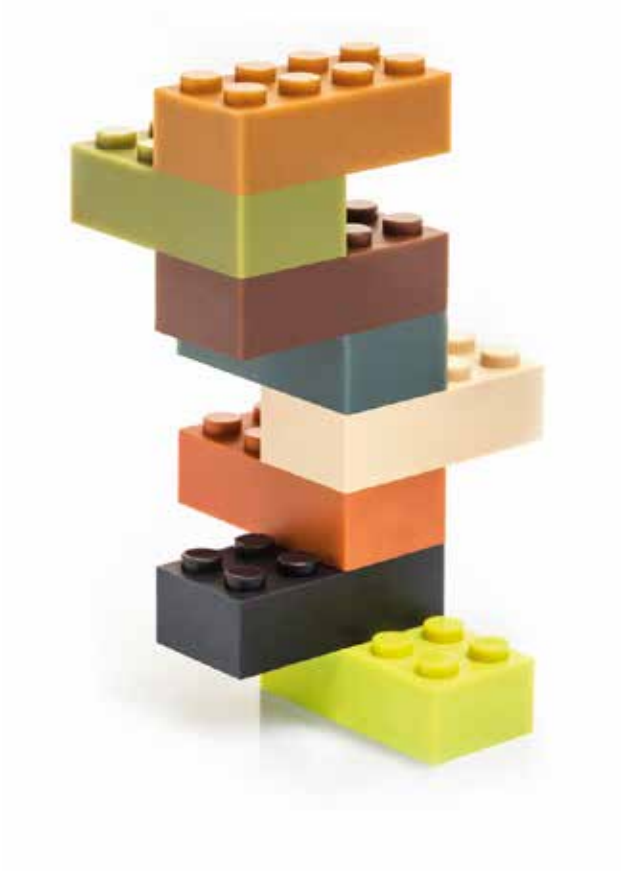

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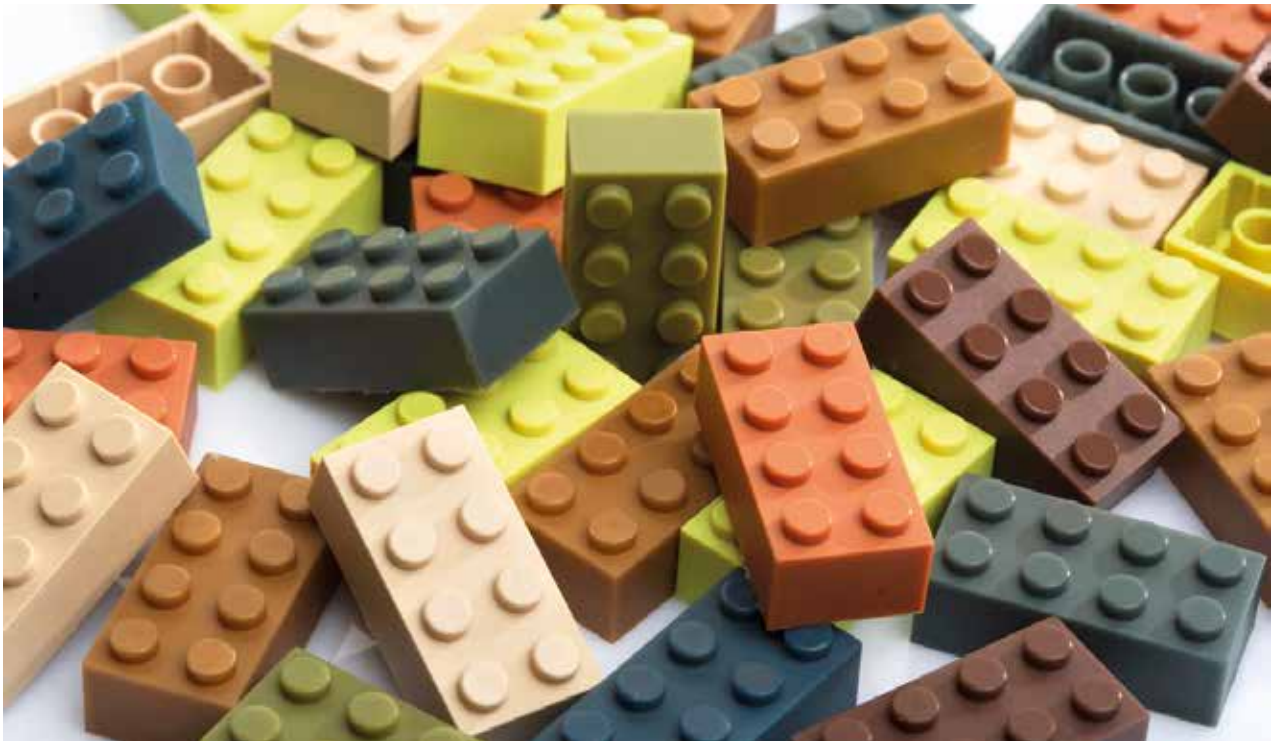
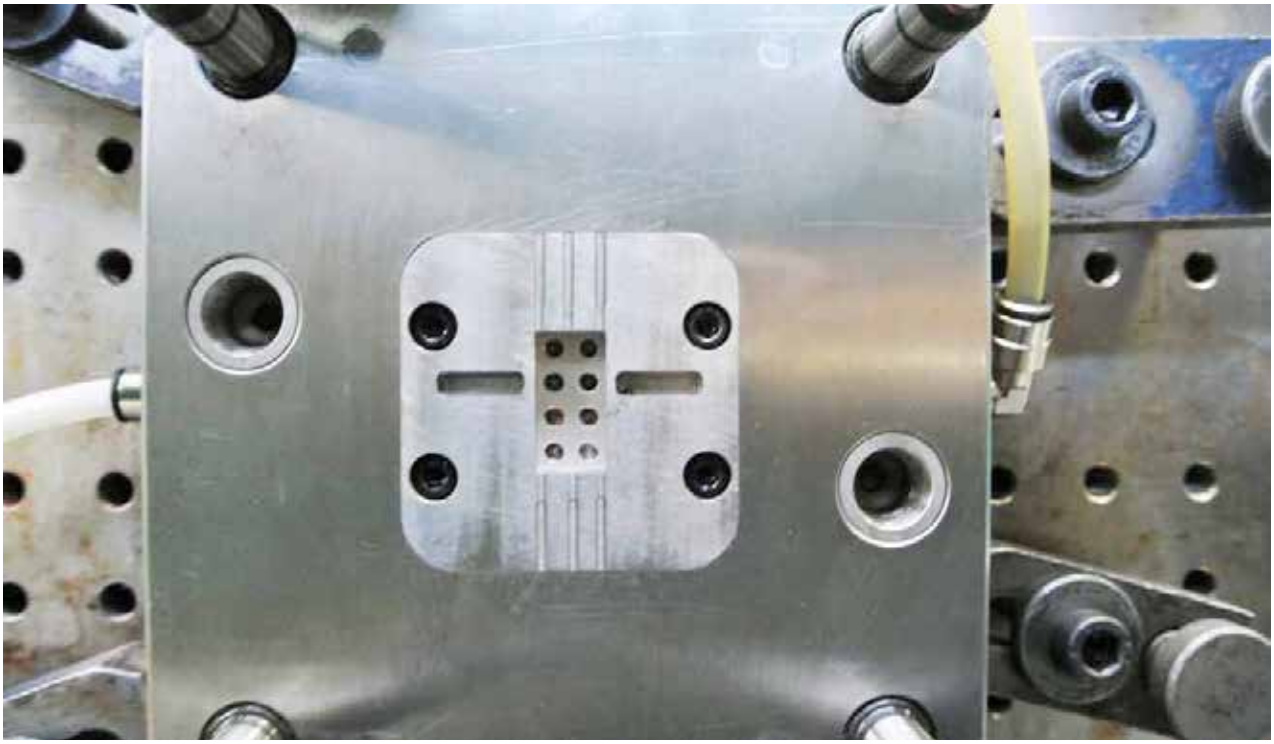


Code: 15007

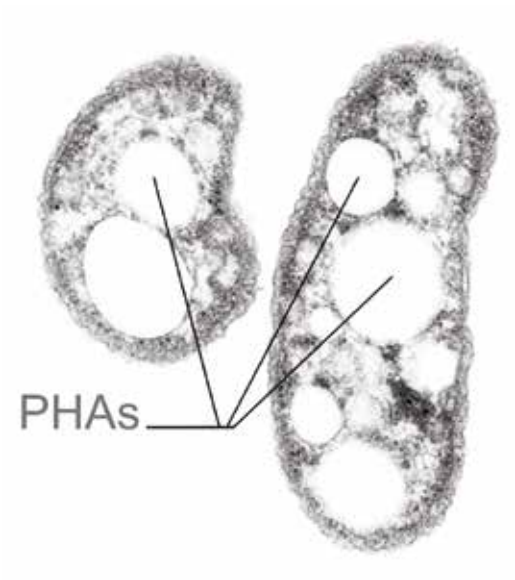
Code: 15008 some examples of minerv PHAs SUPERTOYS granules



Code: 15009 detail of mould for brick similar to LEGO bricks

Code: 15010 detail of side of mould for brick similar to LEGO bricks

Code: 15011 detail of injection press for brick similar to LEGO bricks



Code: 15012 PHAs (white circles) formed as energy reserve in bacteria

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