FACULTY OF BIOSCIENCE ENGINEERING

The Chancellor of Ghent University has the honour of inviting you to attend the public defense of the doctoral dissertation of

Ir. Bo Byloos

Title of the doctoral dissertation:

The interaction of bacteria with volcanic rocks on Earth and in space
De interacties van bacteriën met vulkanisch gesteente op Aarde en in de ruimte

The public defense will take place on the 27th of September 2017 at 16:00 in the Aula Ceremoniezaal, room 06.01 at Campus Aula, Voldersstraat 9, 9000 Ghent

There will be a contiguous reception to which you are heartily invited.
Please confirm your attendance before the 20th of September 2017 to bbyloos@sckcen.be

Dissertation supervisors

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GHENT UNIVERSITY

Abstract of the doctoral research

Microorganisms can interact with minerals for sustaining their survival and growth. These microbe-mineral interactions are involved in bioweathering processes, and have already proved their relevance in agricultural and industrial applications such as enhancing soil fertility, biorestoration, bioremediation and biomining. More recently, microbe-mineral interactions have also become of interest for space exploration missions as they could generate nutrients from 'in-situ material" (ISRU) such as the regolith and rocks. This will reduce the costs and dependency for supplies from Earth and could support a long-term human presence in space.

In our study, the interaction of the bacterium *Cupriavidus metallidurans* CH34 with basalt, a volcanic moon-analog rock, was investigated. The bacterial presence on basalt and its impact on weathering, as well as the effect of basalt composition on nutrient leaching was studied. Differences in lava flow composition, as well as the age of the deposits contributed to shape the microbial communities in terrestrial volcanic rocks, which affects weathering rates and nutrient availability. Different basalt compositions were also shown to impact nutrient leaching and subsequently impact bacterial growth. In addition, survival and the potential impact of space environmental conditions such as microgravity on these interactions were determined, probing the potential of ISRU. Our results indicated that basalt had a positive effect on survival through the release of elements such as sodium, potassium, and phosphate, counteracting some of the detrimental effects of starvation. Space flight conditions in addition also a positive effect on survival while cells form less biofilm. This study contributes to a better understanding of microbe-mineral interactions, opening the door to future applications, in space, and on Earth.

Brief Curriculum Vitae

Bo Byloos was born in Leuven, Belgium on the 20th of February 1988 and obtained a Bachelor degree in Life Sciences at the University of Hasselt. Next, she enrolled at KULeuven to obtain a Master Degree in Bioscience Engineering. In 2013, she received a scholarship from the Belgian Nuclear Research Centre (SCK•CEN) to pursue her PhD at the Faculty of Bioscience Engineering of Ghent University. This PhD was supported by the European Space Agency and the Belgian Science Policy, through the PRODEX program, in order to prepare for the ISS flight opportunity of BIOROCK, which is a European collaboration, investigating microbe-mineral interactions and its applications in space.
During her PhD she studied the interactions of the bacterium *Cupriavidus metallidurans* CH34 with basalt, a volcanic moon-analog rock. The work resulted in four peer-reviewed publications, five presentations, twelve poster presentations at national and international conferences, and six awards. In addition, she guided one master student and gave several seminars and guided practical sessions on the effect of space conditions on bacterial cells.