

# Materials Science and Engineering

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## The new generation of materials for off-earth mining

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The boundaries of human exploration have been expanded to the space and a Mars colonisation process is imminent in the next decades. Due to the harsh environment and the lack of biological resources, to colonise the red planet is not a trivial task, yet it shares similarities with many terrestrial colonisation processes happened during the last centuries. Initial colonisation cargo delivered to Mars should contain essential supplies to support the life of small crews but just for limited time because of the complexity of the interplanetary supply chain which is highly dependent on the launching weight. The launching of the Big Falcon Rocket inserted a new milestone on space cargo capacity; however, having a massive rocket is not enough to sustain human life on Mars because an “ideal” continuous interplanetary supply of materials is limited by physics, financial and technical constraints. Thus, in an analogous way that many colonisation processes occurred on Earth, In-Situ Resources Utilisation via off-Earth Mining (OEM) activities

will be fundamental to sustain human life on Mars. OEM should not only assure a secure supply of essential elements for human survival such as water and oxygen, but also extract essential minerals to be used as a raw material for infrastructure and power generation. Design, construct and maintenance of OEM equipment is a challenging task due to the elevated level of uncertainties regarding the Martian environment and its geology; therefore, they need to be lights, efficient, versatile, enduring and cheap. To fulfil these requirements, there is no other better source than the development of new materials. This presentation explores the evolution of space exploration, reveals the main challenges and risks associated to the Martian colonisation process and the technical requirements for the new generation of materials that OEM needs to expand human presence in the solar system

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