

# Future developments in magnetocaloric refrigeration and heat pumping

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Since the beginning of the engineering of magnetocaloric devices for applications near or above the room temperature, about 70 prototype devices have been developed all over the World. Despite of the fact, that one may observe an exponential growth of publications in this particular domain, it is rather difficult to relate these activities with the S-curve of the technology development. A permutation of articles and a large number of repetitions of earlier scientific or engineering achievements make the transition from science to technology blurred with unclear future results. There exists a strong competition among involved institutes and industries with a rather low level of opened-trusted international and overseas collaboration. Simultaneously important technical problems remain unsolved or even untouched. It is therefore not a coincidence that one can witness rather small steps toward the commercialization of the magnetocaloric technology. However, there exist different engineering solutions which can remarkably foster the developments toward the first real market applications.

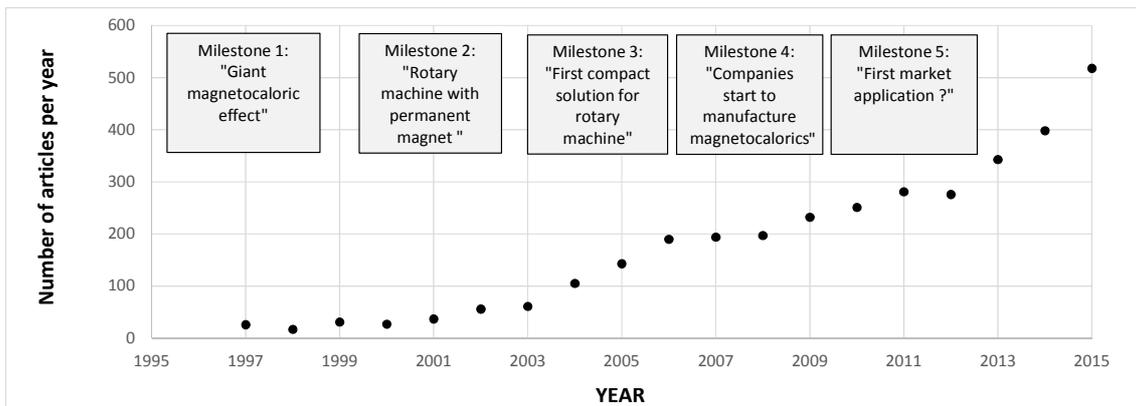


Figure 1. Number of articles found on the ScienceDirect (keyword: magnetocaloric)

This contribution starts with the overview of the technology status and marks the most important achievements up to date. It addresses different research directions by pointing out their weaknesses, advantages, limits, as well as their future applicability. For the purpose of this article, most of the outstanding engineering solutions for the magnetocaloric machine design have been selected and are compared from the economic and the energetic point of view. Additionally to those, some new approaches are discussed and analysed as well. At the end of the paper, guidelines are showing potential future trends of engineering directions by outlining unsolved problems required new knowledge and research work, necessary to bring magnetocaloric devices into different market available devices.