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# Some kinetic features of the mechanochemical $CO_2$ hydridring process during olivine serpentinization reaction

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Among the different processes object of interest for reducing or eliminating $CO_2$ emissions from various industrial processes, the so-called "mineral carbonation" receives wide interest by the scientific community in view to the potential application of different related technologies and also because of the investigation of basic aspects of the involved chemical processes [1,2,3].

Ultramafic rocks as olivine, characterized by high content of magnesium and iron display the highest $CO_2$ mineralization potential, which can be exploited through the serpentinization process, according to which silica-based minerals of Mg and Fe react with $H_2O$ to give H2 and minerals of the serpentine group [$(Mg, Fe)_3Si_2O_5(OH)_4$] [4,5]. In presence of $CO_2$, reaction condition can lead to the formation of carbonates or allow to produce $CH_4$ and light hydrocarbons through a Fischer-Tropsch type or Sabatier type mechanisms. Despite being thermodynamically favoured, the reaction rate is however very slow.

To this regard, mechanical treatment by ball milling has been recognized as a powerful technique to synthesize nanostructured and metastable materials as well as to improve chemical reactivity and sorption kinetics in the study of gas solid interaction [6].

Along this line, in the present work we focus on the mechanochemical activation of the serpentinization process, through the treatment of olivine in presence of $H_2O$ and under $CO_2$ atmosphere. Attention is addressed either to the structural evolution of the solid phases either to the $CO_2$ conversion to methane and light hydrocarbons. Chemical reactivity and reaction rates were investigated under different experimental conditions.

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