Effect of structural disorder of dolomite on decarbonation

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The decarbonation of dolomite generally occurs above 600℃ and thus the residue of thermal decarbonation such as CaO and MgO has long been considered as an indicator of high thermal environmenst. Here, we explore the effect of structural disorder of dolomite on its decarbonation process. A series of structurally disordered ultrafine dolomite powders was obtained by mechanical grinding using high-energy ball mill. X-ray diffraction and ^{25}Mg solid-state nuclear magnetic resonance analysis show that the formation of MgO is accompanied by the extensive deformation and amorphization of dolomite, indicating the mechanical decarbonation without thermal heating. The thermal log of dolomite during the grinding did not exceed 45℃. The structural deformation also affects the thermal decarbonation mechanism of dolomite. In generally, thermal decarbonation of crystalline dolomite show an abrupt decarbonation between 600-800℃, but deformed dolomite show an gradual decarbonation between 400-800℃. The amophous dolomite and/or amorphous Mg-carbonates would lower the onset temperature of decarbonation. The mechanical and low-temperature decarboation of dolomite in the current study provide the insights into carbon cycle in diverse geological setting induding subduction zone and faults, highliting usually unknown effect of amorphization on the decarbonation processes.