The present work is designed to explore the evolutionary and pulsational properties of low-mass white dwarfs with carbon/oxygen cores. In particular, we follow the evolution of a 0.33-$M_\odot$ white dwarf remnant in a self-consistent way with the predictions of nuclear burning, element diffusion and the history of the white dwarf progenitor. Attention is focused on the occurrence of hydrogen shell flashes induced by diffusion processes during cooling phases. The evolutionary stages prior to the white dwarf formation are also fully accounted for by computing the conservative binary evolution of an initially 2.5-$M_\odot$ Pop. I star with a 1.25 $M_\odot$ companion, and period $P_1 = 3$ days. Evolution is followed down to the domain of the ZZ Ceti stars on the white dwarf cooling branch.

We find that chemical diffusion induces the occurrence of an additional hydrogen thermonuclear flash which leads to stellar models with thin hydrogen envelopes. As a result, a fast cooling is encountered at advanced stages of evolution. In addition, we explore the adiabatic pulsational properties of the resulting white dwarf models. As compared with their helium-core counterparts, low-mass oxygen-core white dwarfs are characterized by a pulsational spectrum much more featured, an aspect which could eventually be used for distinguishing both types of stars if low-mass white dwarfs were in fact found to pulsate as ZZ Ceti – type variables. Finally, we perform a non-adiabatic pulsational analysis on the resulting carbon/oxygen low-mass white dwarf models.