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Anisotropy of small scale turbulence in premixed flames BROCK BOBBITT, GUILLAUME BLANQUART, California Institute of Technology — The three Kolmogorov hypotheses are fundamental to the description and modeling of turbulence. It is currently unclear if all three hypotheses remain valid within premixed flames, where dramatic changes in density and viscosity occur. The objective of this study is to assess the validity of Kolmogorov's hypothesis of local isotropy within turbulent premixed flames. Anisotropy is investigated by considering the vorticity vector, which is characteristic of the smallest turbulent scales. This study is performed on a series of direct numerical simulations of n-heptane/air flames which spans a wide range of Karlovitz numbers and density ratios. It is found that the vorticity becomes isotropic for sufficiently high Karlovitz numbers, supporting the validity of the hypothesis of local isotropy. For smaller Karlovitz numbers, the extent of small scale anisotropy can vary through the flame and depends on the Reynolds number as well as the local Karlovitz number. These results are explained through preferential orientation of the flame surface and its alignment with vorticity. A correlation is proposed for the magnitude of the anisotropy with statistics of the flame surface orientation.

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