On the criteria of hydrogen self-ignition during its release from the high-pressure vessel

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The present paper considers two problems of hydrogen self-ignition during its release under high pressure into atmosphere, that have been resolved by CFD methods. In the framework of the first problem, the release is accomplished from a tube or a vessel with a hole or a slit into space enclosed by a wall situated across the direction of hydrogen jet flow. When using different values of initial hydrogen pressure, distance from the diaphragm to the obstacle for given size of the hole / the slit, geometry type (cylindrical or Cartesian coordinates), as well as high-pressure chamber type (tube or vessel), the diagrams of flow regimes are obtained. Three different regimes of hydrogen flow are distinguished: with self-ignition until the jet reaches the wall, with self-ignition as a result of jet reflection from the wall and flow without ignition. In the framework of the second problem, hydrogen release occurs from a vessel through two plane slits of equal width. When using different values of width of slits and distance between them for given initial hydrogen pressure, the diagrams of two flow regimes (with and without self-ignition) are obtained. The achieved results could be useful for the elaboration of hydrogen infrastructure elements.