Regularity for doubly nonlinear parabolic type equations

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We shall consider the second-ordered partial differential equations of parabolic type, which have the p-Laplacian operator and porous medium type power-nonlinearity in the time-derivative. We call the equations doubly nonlinear parabolic type equations. Some combinations of fast and slow diffusions are presented and investigated in the talk. Our aim is to study the regularity of sign-changing weak solutions of them. The motivation for treating sign-changing solutions is that the equations considered here are not translation-invariant on unknown functions and this property is also true for the porous medium equations. We modify the so-called expansion of positivity and apply it for obtaining the decay of local oscillation of sigh-changing solutions. Our proof of regularity is based on the nowadays classical De Giorgi's measure theoretical alternative approach.