Summary: We investigate a class of nonlocal conservation laws with the nonlinear advection coupling both local and nonlocal mechanism, which arises in several applications such as the collective motion of cells and traffic flows. It is proved that the $C^1$ solution regularity of this class of conservation laws will persist at least for a short time. This persistency may continue as long as the solution gradient remains bounded. Based on this result, we further identify sub-thresholds for finite time shock formation in traffic flow models with Arrhenius look-ahead dynamics.

Keywords: nonlocal conservation laws; well-posedness; critical threshold; nonlinear advection coupling

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