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Born-Infeld and Charged Black Holes with non-linear source in $f(T)$ Gravity

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We investigate $f(T)$ theory coupled with a nonlinear source of electrodynamics, for a spherically symmetric and static spacetime in $4D$. We re-obtain the Born-Infeld and Reissner-Nordstrom-AdS solutions. We generalize the no-go theorem for any content that obeys the relationship $\mathcal{T}^{\lambda;0}_{\lambda;0} = \mathcal{T}^{\lambda;1}_{\lambda;1}$ for the energy-momentum tensor and a given set of tetrads. Our results show new classes of solutions where the metrics are related through $b(r) = -Na(r)$. We do the introductory analysis showing that solutions are that of asymptotically flat black holes, with a singularity at the origin of the radial coordinate, covered by a single event horizon. We also reconstruct the action for this class of solutions and obtain the functional form $f(T) = f_0 \left(-T \right)^{\frac{(N+3)}{2(N+1)}}$ and $\mathcal{L}_{NED} = \mathcal{L}_0 \left(-F \right)^{\frac{(N+3)}{2(N+1)}}$. Using the Lagrangian density of Born-Infeld, we obtain a new class of charged black holes where the action reads $f(T) = -16 \beta_{BI} \left[1 - \sqrt{1 + (T/4\beta_{BI})} \right]$.