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Identical relations in some smash products

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ABSTRACT

Theorem Let G be a group, L a Lie algebra over a field K of characteristic $p > 0$, and G acts on L by automorphisms. Denote by $U(L)$ the universal enveloping algebra. Then the smash product $U(L)\#K[G]$ satisfies a nontrivial polynomial identity if and only if the following conditions are satisfied

1) there exists an abelian G-invariant ideal $H \subset L$ of finite codimension and all derivatives $\mathrm{ad}x$, $x \in L$ are algebraic of bounded degree;

2) there exists a normal subgroup $A \subset G$ of finite index with the commutator subgroup A' being finite abelian p-group.

3) A acts trivially on L.

This result generalizes and uses results of D.S. Passman, Yu.A. Bahturin, and V.M. Petrogradsky on existence of identical relations in group rings and enveloping algebras.

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