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Tetrahedral amorphous carbon coatings for friction reduction of the valve train in internal combustion engines

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Tetrahedral amorphous carbon (ta-C) is studied as a tribological coating for the valve train's exhaust camshaft of a combustion engine. The coated camshafts were installed in a non-fired engine, tested in a computerized component test bench under practice-relevant conditions and analyzed for their frictional behavior. A notable reduction of the valve train's drive torque on the test bench is demonstrated. Namely, on a roller cam system with ta-C coated camshaft the reduction is about 15% in average within the entire engine-map. The ta-C coatings were extensively characterized under laboratory conditions before and after the investigations on the test bench. Mechanistic understanding of the tribological behavior of ta-C coatings under dry or starving lubricated conditions was achieved by atomistic simulations of the tribological contact. Industrial utilization of these results would lead to a significant increase of the energy efficiency of combustion engines.

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Keywords

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