Characteristic of double-stator PM machine for modular type power train in electric vehicles

ABSTRACT

This paper presents a double-stator permanent magnet brushless DC machine (DS-PMBLDC) which is proposed to be used in light electric vehicles and to replace a typical motor for electric vehicles in future. However, to fulfill the limitation of motor performance at different conditions, electric vehicles require their own specific motor design. Thus, a modular type of motor which can easily replace the electrical motor based on requirements for the electric driving system in power train of an electric vehicle was proposed and discussed in this paper. The operating principle of the proposed machine is reported. Concentrated winding is adopted for the stators of a 9-slot 8-pole DS-PMBLDC machine. The cogging torque, back-EMF, air-gap flux density, torque and power characteristic have been analyzed using 2-dimensional Finite-Element Analysis (2D-FEA). Experimental and simulation results are compared and discussed. Theoretical analysis of the proposed machine show an efficiency of 80% and 75% efficiency in motoring and generating mode respectively. The 2D-FEA simulation results are in good agreement with the measurement results.