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ABSTRACT:

From Materials to End Use: Where Hydrogen and Electrification Fit

Department of Mechatronics Engineering,
Iskenderun Technical University, Central Campus,
Turkey

Adding wheels to a suitcase changed how it could be used without redesigning the suitcase itself. This invited talk applies the same idea to energy systems, asking when a change in one material or component improves performance across the whole system. It begins with experiments that introduced hydrogen and oxyhydrogen (HHO) into an existing diesel engine, then turns to the dry cell that produces HHO. In a published experiment at 3 A, adding multiwalled carbon nanotubes to the electrolyte raised the measured HHO production rate to approximately 2.2 times that of the baseline electrolyte. The gain declined during longer operation, and particle settling was observed.

A follow-up numerical study under review examines whether 40 kHz acoustic excitation can redistribute the particles. The model suggests that ultrasound can mobilize them. Sustained gas output and the net energy effect of the intervention remain to be tested experimentally. The talk then takes the same system perspective into hydrogen aviation and hybrid electric rail. It considers how storage mass and volume, conversion losses, and operating requirements shape the choice between using renewable electricity directly and converting it to hydrogen. These examples show how assessing the complete system can help determine where hydrogen and electrification complement each other.