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Mohammad Hadi Moghim, Rahim Eqra, Mohsen Babaiee, Mohammad Zarei-Jelyani, Mohammad Mohsen Loghavi

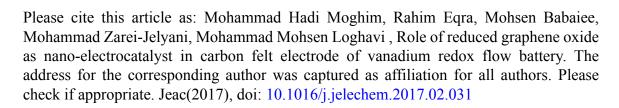
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ACCEPTED MANUSCRIPT

Role of Reduced Graphene Oxide as Nano-electrocatalyst in Carbon Felt

**Electrode of Vanadium Redox Flow Battery** 

Mohammad Hadi Moghim<sup>a</sup>, Rahim Eqra<sup>a,b\*</sup>, Mohsen Babaiee<sup>b</sup>, Mohammad Zarei-Jelyani<sup>b</sup>, Mohammad Mohsen Loghavi<sup>b</sup>

<sup>a</sup> Department of Materials Science and Engineering, Engineering School, Shiraz University, Shiraz 71348-15939, Iran

<sup>b</sup> Institute of Mechanics, ISRC, Shiraz 71555-414, Iran

**Abstract** 

Carbon-based electrodes are usually used in vanadium redox flow batteries and

electrochemical performance of these electrodes can be modified by electrocatalysts. In the

current study, reduced graphene oxide inks with different concentrations were used to modify

a carbon felt electrode. It was observed that CF which was modified in 2 mg/ml ink (CF-G-2)

had the optimum combination of electrochemical properties, because no significant peak

current improvement was observed at higher graphene contents and it also had the minimum

value of  $\Delta E_p$ . The anodic and cathodic peak currents for positive redox couple reaction in CF-

G-2 reached to 45.3 and 21.1 mA respectively, in comparison with 14.2 and 4.7 mA values

for bare felt. Linear diffusion coefficient was also enhanced more than two times with the

incorporation of graphene. Nyquist plots of CF-G in different electrolytes (VOSO<sub>4</sub>/V<sub>2</sub>O<sub>5</sub> and

VOSO<sub>4</sub>) showed different shapes and equivalent circuit data indicated much lower charge

transfer resistance for modified carbon felts with graphene. The diffusion process was

remarkably facilitated with the incorporation of reduced graphene oxide and graphene had

desirable influence on the electrolyte absorption of carbon felt. Finally, scanning electron

micrographs of electrodes demonstrated loaded graphene nanosheets on the surface of carbon

felt fibers.

**Keywords:** Vanadium redox flow battery; Reduced graphene oxide; Electrocatalysis; Carbon

felt

\*Corresponding author.

E-mail address: eqra\_1343@yahoo.com (Rahim Eqra).

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