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## Role of erythrocytes and leucocytes in charge transfer through human blood

By: Abdalla, S (Abdalla, S.)<sup>[1]</sup>; Al-Marzouki, F (Al-Marzouki, F.)<sup>[1]</sup>; Al-Ghamdi, AA (Al-Ghamdi, A. A.)<sup>[1]</sup>; Al-Malki, AL (Al-Malki, Abdulrahman L.)<sup>[2]</sup>

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### Abstract

One of the rare subjects that is still keeping its scientific importance for a long time are the electric and dielectric properties of human blood. However, this viable fluid has a huge quantity of unexplored domains. For example, despite the wide applications of metallic electrodes in biophysics, only few authors have examined the correlation between the electrode polarization and the dielectric alpha dispersion of micro-dipoles present in bio-fluids such as human blood. Even more, no other authors have reported the presence of alpha dispersion in blood. A theoretical model is presented in which different micro-components through blood (for example red and white blood cells) play an essential role in transferring the electric energy between two metallic electrodes. After the application of ac-electric field to blood, it is shown that in addition to the presence of electrode polarization; alpha, beta and gamma dispersions are present and can carry out the electric energy through blood. It has been demonstrated that the electrode polarization through blood can completely mask the alpha dispersion which may explain why this latter has never been detected through blood. The presented model has successfully fitted to some recent published experimental results that confirms the micro-particle electric conduction and shows the presence of alpha dispersion in blood. This will improve diagnostic-medical applications of metallic electrodes as micro biosensors and potential different therapeutic-medical applications. (C) 2012 Elsevier B.V. All rights reserved.

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**Author Keywords:** Micro-particle conduction; Electrode polarization; Alpha dispersion; Human blood; Complex permittivity

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### Author Information

**Reprint Address:** Abdalla, S (reprint author)

+ King Abdulaziz Univ, Dept Phys, Fac Sci, POB 80203, Jeddah 21589, Saudi Arabia.

#### Addresses:

+ [ 1 ] King Abdulaziz Univ, Dept Phys, Fac Sci, Jeddah 21589, Saudi Arabia

+ [ 2 ] King Abdulaziz Univ, Dept Biochem, Fac Sci, Jeddah 21589, Saudi Arabia

**E-mail Addresses:** [soulimanabd@hotmail.com](mailto:soulimanabd@hotmail.com); [alalmalki@kau.edu.sa](mailto:alalmalki@kau.edu.sa)

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