Evaluation of a Novel Electrode Design for Separation of Water-in-Oil Dispersions by Electrocoalescence

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***Abstract*— The removal of water from crude oil is crucial to reduce transportation costs, corrosion of the process equipment and catalyst poisoning. Compared to other methods, electrical demulsification is an energy-efficient and environmentally friendly process. In this study, DC fields are applied to promote coalescence between dispersed water drops in a silicon oil continuous phase. The effectiveness of a novel geometry of the electrodes is investigated: it consists of a set of two electrodes made of bare wire mesh electrodes stacked along the flow direction of the continuous phase. Droplet growth is assessed by image analysis. The effect of the sieve opening size on droplet growth is addressed and an arrangement comprising two sets of nested electrodes with different sieve openings is also tested. For the two sieve openings used, the performance of the device does not differ significantly in terms of separation efficiency, but larger droplet size is found at the outlet with the wider sieve opening. A significant improvement of droplet growth is observed when two sets of electrodes are used. The outcomes in terms of coalescence enhancement are encouraging and further optimization of this concept may therefore lead to the development of a compact electrocoalescer.**