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# Novel Four-arm Star Oligomeric Surfactants :Synthesis and Tensioactive Properties

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**ABSTRACT:** Novel Four-arm-star shaped oligomeric (Tetrameric) surfactants, bearing four alkyl aryl hydrophobic chains and four anionic hydrophilic headgroups connected by pentaerythritol, were firstly designed and synthesized by four-step procedures involving the aryl oleic acid pentaerythritol ester as key intermediates for connecting amphilic moieties. The surface active properties, including the critical aggregation concentration(CAC), surface tension at the CAC( $\gamma_{CAC}$ ), ability of these compounds to lower surface tension of 0.02N/m ( $pC_{20}$ ), minimum surface area occupied by per surfactant molecule ( $A_{min}$ ) and the maximum surface excessive concentration( $\Gamma_{max}$ ), were studied at 25 and 45°C. It was found that the molecular architecture of these compounds strongly influences the values of physicochemical parameters. The ability to reduce surface tension is weakened with increasing the number of substituents on the aromatic ring. A-marked surfactant exhibits excellent surface activities at 45 °C. The  $pC_{20}$  values at 25°C have opposite trends compared with the ones at 45°C, which were changed by temperatures for revealing the aggregation behavior of these three surfactants. Interestingly, the surfactants displays high emulsification ability to aromatic compounds even at very low concentration.

**Keywords:** star-shaped oligomeric surfactants; surface tension ; tetrameric surfactants; emulsification ability

## Introduction

Conventional surfactants are compounds that possess a polar hydrophilic group and a nonpolar hydrophobic group in a molecule. The separation tendency caused by the repulsion or hydration of the ionic head groups makes them difficult to be arranged in the interface or the molecular aggregates, which causes the low surface activity. Although the polymeric surfactants with high molecular weight have good solubilization, increasing consistency, dispersion and flocculation, but in general it is

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