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Ultrasonic studies and acoustic behavior of cerium and thorium laurate in benzene–methanol mixture

■ ANUSHRI GUPTA AND S.K. UPADHYAYA

Author for Correspondence -
ANUSHRI GUPTA
Department of Chemistry,
S.S.L. Jain P.G. College, VIDISHA (M.P.) INDIA
guptaanushri@yahoo.com

See end of the article for authors affiliation

ABSTRACT - Ultrasonic velocity of cerium and thorium laurate in benzene-methanol mixture was used to determine the CMC, soap solvent interaction and various acoustic parameters. The results show that ultrasonic velocity, specific acoustic impedance, molar sound velocity increases with increasing soap concentration and decreases with the increase in temperature while intermolecular free length, adiabatic compressibility, apparent molar volume, apparent molar compressibility and solvation number decreases with increase in soap concentration. The internal pressure of the solutions decreases with increase in soap concentration at all temperatures. The results of ultrasonic measurements have been interpreted in the light of well known equations.

Key words - Ultrasonic velocity, CMC, Compressibility behavior, Internal pressure, Acoustic parameters, Soap-solvent interactions

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Most striking feature of metal soaps is their increasing importance in different industries as well as in academic fields. The applications of metal soaps is required in various fields[1-4] such as lubricating greases which is intended to improve flow, coating smoothness, finish, printability, antidusting effects, driers in paints, dry cleaning industries, cosmetic gels, heat stabilizers for plastics and in the development of polyvinylchloride as an important commercial polymer and other uses as fungicides and pesticides[5], optical polymer fibers[6], coating pigment in paper industry[7] and in the preparation of nanofilms[8] are due to their appreciable solubility inorganic solvent , stability and chemical reactivity, together with their volatility and availability .The study and understanding of acoustical properties are necessary for their applications in various fields. Ultrasonic methods have been used for providing interesting information on the specificities of ion-solvent interactions related to the structure of solute and solvation of soaps in organic liquids[9], complex formation[10] and in non-aqueous solvents[11,12]. Acoustical studies on Uranyl soaps of lower fatty acids have been studied by Varsha *et al.*[13]. Suleman *et al.*[14, 15] studied ultrasonic behavior of transition metal soap in liquor ammonia. Acoustical studies, compressibility behavior and Rao formalism of lanthanide soap solutions were carried out by Upadhyaya and Chaturvedi[16].

In comparison of earlier studies on metal soaps, we report here results of our studies on ultrasonic velocity of cerium and thorium laurate in 70/30 benzene-methanol (V/V) of varying concentration and temperature in order to compute various acoustical parameters. These parameters give clear insight into the formation of micellar aggregates of cerium and thorium laurate in non-aqueous medium and effect of concentration and size of metal ion on soaps.

EXPERIMENTAL METHODOLOGY

AnalaR grade lauric acid, benzene, methanol, ethanol, cerium nitrate and thorium chloride (purity99.9% received from Indian Rare Earth Limited, Kerala) were used for the present