

论文

液体薄膜遮光效应的研究

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摘要:

当激光束通过静态液体薄膜时,由于表面的全反射效应能够观察到液体薄膜的遮光效应.在此基础上,以白光为光源研究了液体薄膜的遮光效应.结果显示,白光光源的遮光图样非常清晰,且无激光散斑效应|遮光图样的中心是一个光强极强的亮域,该区域的外部为两个同心的环状暗场,两个暗场之间是亮场,亮暗边界十分清楚|液体薄膜遮光图样的半径大小与液体的折射率有关,液体折射率越大,遮光图样的半径越大.本文给出了液体薄膜遮光半径与液体折射率的解析关系,分析了遮光图样产生的必要与充分条件,并根据液体薄膜的遮光效应,建立了一种测量液体折射率的新方法,测量了纯净水的折射率.结果表明,该测量值与传统方法所测折射率的值相吻合且该方法具有设备简单、操作简便、重复性好、准确度高等特点.

关键词: 液体薄膜 遮光效应 折射率

Light Obstructing Effect of Liquid Membrane

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Abstract:

When a laser beam passes through the static liquid membrane,the light obstructing effect is observed due to surface total reflection.Based on this fact,the similar light obstructing effect was also observed using a white light source,and the obtained obstructed light photos were clear and with no laser speckles.The obstructed light pattern consists of a bright region with significantly high light intensities in the center,two strip-shape dark regions outside,and a bright field between these two strip-shape dark regions.The boundaries between these bright and dark regions were clear.It was found that the radius of obstructing increases with the increasing of the refractive index.Moreover,the relationship between the liquid membrane refractive index and the radius of light obstructed was derived,and the necessary and sufficient conditions of the obstructed light photos for liquid membrane were also analyzed.Therefore,according to the effect of light obstructing of liquid membrane,a new method for measuring liquid refractive index was proposed.The refractive index of pure water was measured and the obtained results were good in line with those measured by the traditional methods.The proposed method has advantages in simplifying the equipments and operations,and also possesses sound reliabilities and high measuring accuracy.

Keywords: Liquid membrane Light obstructing Refractive index

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