A MATHEMATICAL PROBLEM RELATED TO THE PHYSICAL THEORY OF LIQUID CRYSTAL CONFIGURATIONS

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1. INTRODUCTION

The purpose of this note is to explain a mathematical problem in liquid crystal configuration and the mathematical tools that one is naturally lead to use in order to understand it.

It will turn out that one necessarily has to understand the structure of the set of singularities of functions of bounded variation. This was first studied by the fundamental work of De-Giorgi [16], [3] and H. Federer [7]. (see also Vol'pert [15], and Simon [12]). In this note we shall explain a different method that we have used in order to study this basic fact and which is useful to study the liquid crystal problem which we shall explain in Section 2. As a matter of fact we have recovered the well known results mentioned above and furthermore we have obtained new information that we shall be briefly discussing.

Our approach is motivated by the original work of De-Giorgi on the study of the set of singularities of a characteristic function of a set of finite perimeter, see [16] p.3-62 (see also Example (B) in Section 3.2). Roughly speaking we can say that we recover