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Long Miao, Jia Zhang

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## On a class of non-solvable groups \*

Long Miao<sup>1,†</sup>, Jia Zhang<sup>2,1</sup>

1. School of Mathematical Sciences, Yangzhou University, Yangzhou 225002, China

2. School of Mathematics and Information, China West Normal University  
Nanchong 637009, China**Abstract**

In this paper, we use the properties of subgroups with given order to study the structure of finite groups. The main result is as follows:

Let  $G$  be a group and  $P$  be a Sylow  $p$ -subgroup of  $G$ . Suppose that  $1 < d \leq |P|$ . If every subgroup  $H$  of  $P$  with  $|H| = d$  is  $\mathcal{M}$ -supplemented in  $G$ , then every non-abelian  $pd$ - $G$ -chief factor  $A/B$  satisfies one of the following conditions:

- (1)  $A/B \cong PSL(2, 7)$  and  $p = 7$ ;  $A/B \cong PSL(2, 11)$  and  $p = 11$ ;
- (2)  $A/B \cong PSL(2, 2^t)$  and  $p = 2^t + 1 > 3$  is a Fermat prime;
- (3)  $A/B \cong PSL(n, q)$ ,  $n \geq 3$  is a prime,  $(n, q - 1) = 1$  and  $p = q^n - 1/q - 1$ ;
- (4)  $A/B \cong M_{11}$  and  $p = 11$ ;  $A/B \cong M_{23}$  and  $p = 23$ ;
- (5)  $A/B \cong A_p$  and  $p \geq 5$ .

*AMS classification:* 20D10, 20D20

*Keywords:*  $\mathcal{M}$ -supplemented subgroups, chief factor, composition factor, simple groups

**1 INTRODUCTION**

All groups considered in this paper will be finite. We shall adhere to the notation employed in [5,9]. In particular, let  $\pi$  be a set of primes,  $\pi'$  be the

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†Corresponding author. E-mail: lmiao@yzu.edu.cn

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